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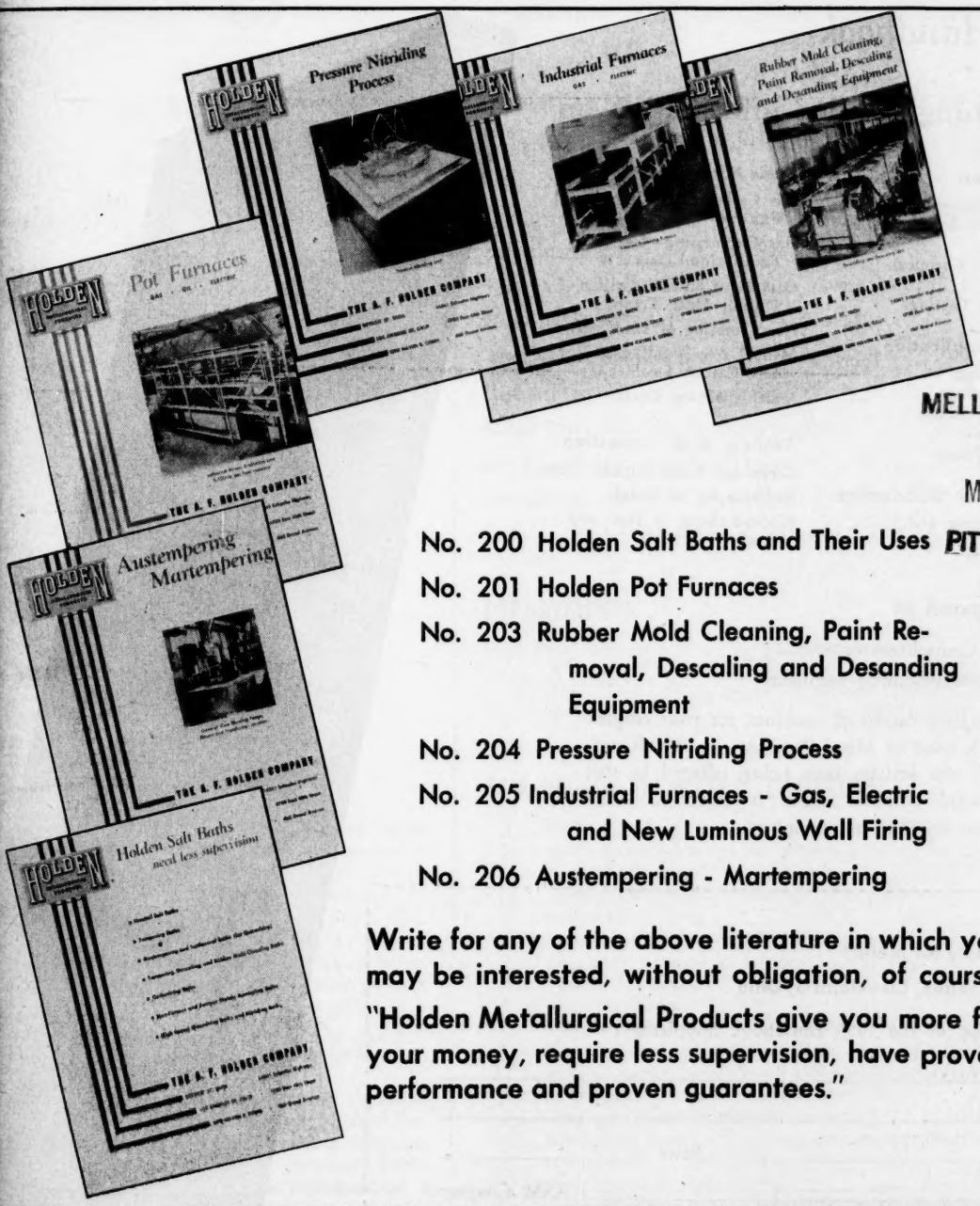

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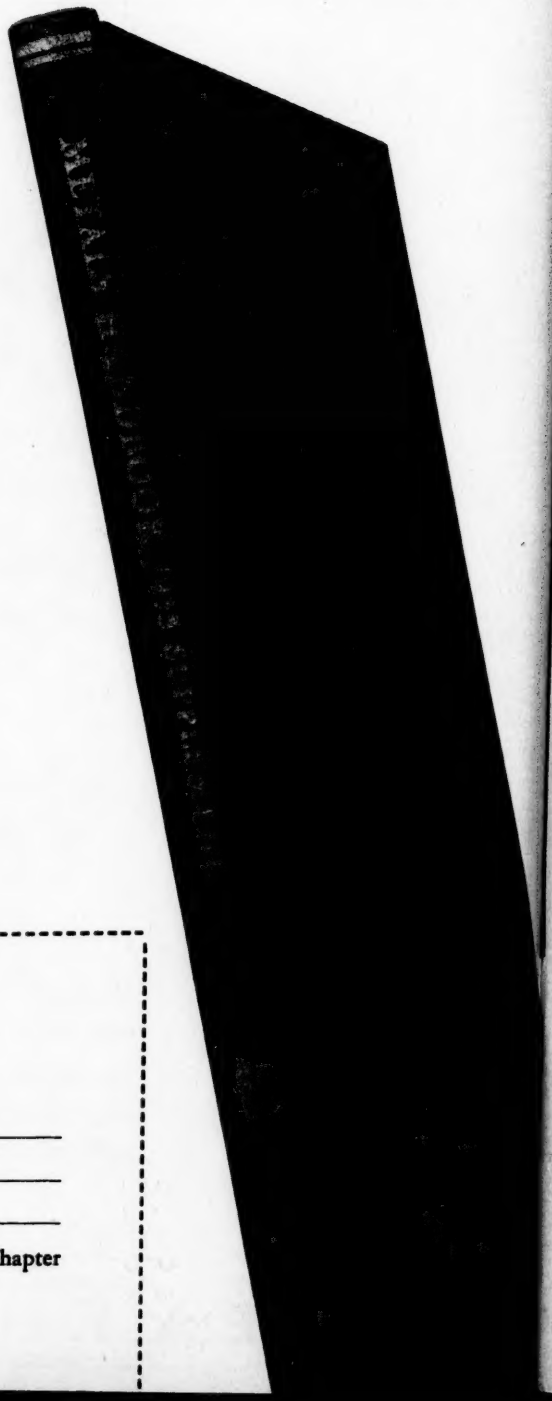

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Metals Review

Volume XXIX, No. 2 February, 1956

THE NEWS DIGEST MAGAZINE

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Speaks on Sintered Metal Parts

From Left: Herman Koester, Jr., Technical Chairman, Robert Talmage, Powder Metallurgy Consultant, Who Spoke on "Sintered Metal Parts", and John L. Morosini, Chairman, Are Shown at a Recent Meeting in Boston

Speaker: Robert Talmage

Powder Metallurgy Consultant

Robert Talmage, powder metallurgy consultant, New Canaan, Conn., presented a talk on "Sintered Metal Parts" at a recent meeting of the **Boston Chapter.**

The meeting was opened with the showing of an excellent color film on the mixing, pressing and sintering of brass parts for locks, supplied by the Kwikset Lock Co.

Mr. Talmage stressed the most popular form of powder metallurgy, which, in his opinion, is sintered steel parts. A brief history of the industry was outlined, from its origin in 1937 at the General Motors Corp. where the first oil pump gears were made by sintering. The original set of tools produced 50,000 pieces. Oxygen gas was used as an atmosphere, with 2% graphite added to reduce decarburization. Magnetism was a factor making it difficult to produce uniform parts from the press.

Sintered parts today have far superior properties. Tensile strengths of 50,000 to 75,000 psi., with single processing, and over 100,000 psi. through double processing, have been attained. Controlled porosity which imparts excellent lubrication properties to the part is one of the outstanding features available through sintering. A sintered bushing, for example, will last up to 600% longer than a wrought part made from the same alloy. Uniformity of size and weight is such that sintered parts may be accurately counted by weighing methods.

The speaker outlined in detail the processes involved in sintering several alloys, including the cost of tools and equipment which is required for the operation.

During his talk Mr. Talmadge was open for questions from the floor. It was apparent from the number of questions that there exists a wide interest in the subject. The speaker also demonstrated a variety of articles produced by sintering.—**Reported by William H. McCarty for Boston Chapter.**

Brittle Fracture Problems And How They Are Solved Discussed at Tri-City

Speaker: W. S. Pellini

Naval Research Laboratory

"Metallurgical Aspects of the Brittle Fracture Problem" was the subject of an address by William S. Pellini, superintendent of the metallurgy division of the Naval Research Laboratory, at a meeting of the **Tri-City Chapter.**

The question as to how large welded structures of ductile material can suddenly fail in a completely brittle manner, while not an entirely new problem, was brought into focus during World War II by the brittle failure of a large number of welded mild steel ships. The magnitude and gravity of this situation led to a careful analysis of the problem by a number of agencies. Most of the misconceptions regarding this type of failure have now been cleared away and a better understanding of the factors involved has brought satisfactory progress toward a remedy.

The initiation of every failure of this type has been traced to the presence of a crack, notch or other stress concentrating defect, either in the weld or the steel plate. This condition, associated with the inability of the particular steel to resist brittle fracture propagation under the existing stresses and temperature is the factor which produces the failure.

Of particular interest to the group was the explosion impact test which was developed at the Naval Research Laboratory in the study of the problem. The heavy steel plates are subjected to a controlled explosive force after first simulating a crack defect by placing a welding arc strike or small bead of brittle welding alloy at the point of maximum stress. This brittle spot cracks with the slightest bending and tests the ability of the surrounding material to resist crack propagation under the test conditions. Samples of the plate from failed weldments subjected to the test all showed a tendency to shatter without deformation at the temperature of the original failure.

The transition with decreasing temperature from ductile to brittle behavior of various plate materials was clearly traced by the explosion impact test. It was demonstrated that the transition ranges so established could be closely correlated with V-notch Charpy data. A useful procedure was thus set up for accurately predicting the behavior of a given steel plate at any temperature when stressed under the most severe condition with crack-like notch defects. As a result of these findings, specifications are being developed for steel with transition temperatures sufficiently low that they will remain tough in the presence of such defects at the lowest anticipated service temperatures.

Mr. Pellini's talk was illustrated throughout with excellent slides. It was followed by an extensive period of questions and answers.—**Reported by R. H. Sholtz for Tri-City.**

Peoria National Officers Night Honors Pres. Schaefer

Speaker: Adolph A. Schaefer

Midvale Co.

National Officer's Night at the **Peoria Chapter** was highlighted by the presence of Adolph O. Schaefer, A.S.M. president, and W. H. Eisenman, national secretary.

Mr. Schaefer, vice-president in charge of engineering and manufacturing at the Midvale Co., spoke on the "Application of Emergency Metallurgy to Peacetime Work".

Mr. Eisenman, after relating many of the highlights of last summer's European tour, spoke to the group about the Society's dynamic five-point expansion program. He emphasized the progress of the expansion program and the Society's thinking into the future.—**Reported by J. M. Warfield for Peoria.**

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Jacksonville Tours Fabrication Plant

Speakers: Frank O. Guba
John Minihan

The why of corrosion and working of stainless steel tubing were explained by Frank O. Guba, engineer in charge of process development, Carpenter Steel Co., and the advantages of electric resistance welding on nonferrous alloys were explained by John Minihan, district manager, Sciaky Bros., Inc., at a recent meeting held in **Jacksonville.**

The meeting was held in the W. L. Rives new fabrication plant in Jacksonville and after the talks a tour was organized and taken through the plant. Rives is the only plant in the Southeast part of the country doing the highly specialized work of fabricating stainless steel and monel metal for the pulp and paper industry and chemical plants. Rives builds monel metal tanks for the Army, Navy and civilian vessels, and following the designs of engineers, the company builds fittings, tanks, vessels, rectifier rolls and mixers or makes replacements for machinery already set up.—**Reported by H. J. Huester for Jacksonville Chapter.**

Reactor Technology School

The Oak Ridge School of Reactor Technology is now accepting applications for enrollment in the 1956-57 session. The School is a division of the Oak Ridge National Laboratory, which is operated by Union Carbide and Carbon Corporation for the A.E.C. Industrial organizations and government agencies are invited to sponsor people from their technical staffs for this 50-week training program in nuclear reactor engineering. The deadline for receipt of applications is Mar. 12, 1956; the session begins on Sept. 10, 1956. Further information and application forms may be obtained from the Director, Oak Ridge School of Reactor Technology, Oak Ridge National Laboratory, **P. O. Box P, Oak Ridge, Tenn.**

High-Temperature Alloys Talk Presented at Tulsa

Speaker: Hiram Brown
Solar Aircraft Co.

Hiram Brown, Solar Aircraft Co., spoke before a meeting of the **Tulsa Chapter** on the subject "High-Temperature Alloys and Coatings for High-Temperature Use".

The talk embraced a brief discussion of some of the high-temperature alloys, such as the stainless steels, nickel and cobalt-base alloys. Their comparative high-temperature properties were discussed as well as the results of certain thermal shock tests which have been made on a variety of alloys. Comparison was made of cast and wrought alloys of similar composition.

Protective coatings for high-temperature use were also discussed. These coatings covered such things as ceramic coatings, aluminized coatings and the cermet-type of coating. The need for these coatings and what benefits can be expected from their use was discussed.

In the process of discussing coatings, the shortcomings of certain alloys at high temperatures were also pointed out.

The speaker also made brief comments on the relative merit of present day creep tests insofar as the jet and high-temperature applications are concerned.—**Reported by J. C. Holmberg for Tulsa Chapter.**

Receive Science Awards in Oklahoma

Future Scientists Suzanne Berry and Bobby Frank of Norman, Okla., Receive First and Second A. S. M.-Sponsored Future Scientists of America Foundation Awards From H. H. Bliss, Left, Director of the Oklahoma Science Service. Suzanne's and Bobby's progress from Honorable Mentions last year reflects the interest generated by their teacher, Vivla Johnson

Outlines Methods of Penetrant Inspection

Speaker: C. E. Betz

Magnaflux Corp.

C. E. Betz, vice-chairman of the board of directors of Magnaflux Corp., presented a "Current Appraisal of Inspection With Penetrants", at **Rocky Mountain Chapter.**

Mr. Betz discussed the history and development of penetrant methods, and various factors to be taken into consideration in choosing and applying penetrants to nondestructive testing problems.

The versatility of the penetrant method of inspection was shown as were its problems and limitations.

It was pointed out that getting the penetrant into the crack, flaw or discontinuity is only one part of the problem, a further phase being that of causing it to seep from the crack at the proper time and in sufficient volume to be visible to the inspector.

Mr. Betz discussed and compared some of the fluids and dies used as penetrants, both past and present, including fluorescent varieties.

Slides and charts were shown illustrating various flaws, comparisons of methods and problems encountered. One of the basic problems of the nondestructive testing field is the lack of specifications. The difficulty of writing specifications in the penetrant field was pointed out. Most factors can be standardized, except the crack itself, its nature, size and the material in which it occurs. There seems to be no such thing as a standard crack.

The meeting was concluded with a question and answer session.—**Reported by V. D. Heinze for Rocky Mountain Chapter.**

Discusses Hydrogen Embrittlement

William M. Baldwin, Jr., Department of Metallurgical Engineering, Case Institute of Technology, Spoke on "Hydrogen Embrittlement of Ultra-High Strength Steels and Premature Failures" at a Joint Meeting Held by the Dayton Chapters A.S.M. and A.E.S. Shown are, from left: Dr. Baldwin, H. J. Reindl, Chapter chairman, and D. L. Upp, University of Cincinnati

Speaker: W. M. Baldwin, Jr.

Case Institute of Technology

William M. Baldwin, Jr., director of research of the department of metallurgical engineering, Case Institute of Technology, spoke before a joint meeting of the **Dayton Chapter** and the American Electroplaters Society on "Hydrogen Embrittlement, Embrittlement of Ultra-High Strength Steels and Premature Failures". He presented his investigation on the ductility of SAE 1020 steel at strain rates varying from 0.05 in. per in. per min. to 1900 in. per in. per min. This represents rates obtainable on a standard tensile testing machine to those obtained on a drop hammer. The temperature range investigated was from +150 to −320° F. The purpose of his work was to obtain a fuller characterization of the effects of varying temperature and strain rate on the fracture strain of hydrogen charged steel.

Hydrogen embrittlement was pictured as resulting from the precipitation of hydrogen in substructure disjunctions or "voids" at pressures sufficient to force metal asunder. Dr. Baldwin explained that both high and low temperatures remove the embrittlement that hydrogen confers upon steel at room temperature, and also that high strain rates have similar effects. Graphs were shown on the temperature effect on the fracture strain at four different strain rates. This was then pictured on a three-dimensional graph slide showing the temperature, strain rate and fracture-strain relationships. The plot revealed that the locus of the minima in the ductility of the charged steels divided the ductility surface into two domains, one at low temperature and the other at high temperature.

Dr. Baldwin showed that in the low-temperature area of the graph the ductility of steels depends upon two competitive rates, the steel being ductile if the strain rate predominates and brittle if the embrittling reaction rate with increasing temperature predominates. In the high-temperature area of the graph it was shown that the embrittling reaction rate with increasing temperature predominates. In the high-temperature area of the graph it was shown that the embrittling action must decrease with increasing temperature.

During the discussion that followed the talk, it was indicated that the normal treatments performed to combat hydrogen embrittlement do not eliminate it but merely minimize its effects.—**Reported by Walter J. Bidd for Dayton.**

York Tours Carpenter Steel Co.

Members of the York Chapter Toured the Plant of Carpenter Steel Co., Reading, Pa. After the tour, William H. Kemper, metallurgist at Carpenter, presented a talk on "Stainless Steels." Shown is Mr. Kemper (center) shaking hands with Roy Livington, chairman. Mr. Murphy, on the left, is from Carpenter's sales department. (Reported by C. W. Walter)

Present Status of A.S.M.'s Metals Engineering Institute

By Anton Brasunas
Director, M.E.I.

As A.S.M. members probably know, the future plans of the Society include, among other things, the creation of a Metals Engineering Institute, whose purpose is to administer education courses in the field of metallurgy. Although this is to be done primarily by correspondence, there will be provisions for in-plant training and cooperation with the educational committees of the various A.S.M. chapters.

This educational venture is the second of the broadly envisioned five-point program which National Secretary William H. Eisenman outlined a year ago. We are now approximately at the three-quarter mark in getting the M.E.I. (Metals Engineering Institute) under way. In fact, we have already begun; the M.E.I. cooperated with the metallurgical engineering department of New York University in sponsoring a highly successful Titanium Symposium in mid-September. Much of the material of our Course No. 27 was orally presented there, and the demand for reprints was so great that the need for an organization such as the M.E.I., to provide up-to-date technical information, is clear.

At the present time, 5 of the 40 metallurgical courses are almost completely written; these are now being reviewed by academic and industrial personnel to assure their accuracy, completeness and lucidity. The other 35 courses are in various stages of preparation. Each course will be composed of 15 separate lessons, making a total of 600 lessons.

By the beginning of 1957, we expect to be in full operation. Nevertheless, we hope to be testing the five almost-complete courses by spring, 1956. These are:

Course 2—Survey of Steel Plant Processes
Course 10—Heat Treatment of Steel
Course 16—High-Temperature Alloys
Course 27—Titanium—The Metal, Its Alloys and Their Uses
Course 34—A Practical Approach to Nonferrous Foundry Practice

Our plan of cooperation with the various A.S.M. chapters is to provide text material and slides for the speaker or speakers of a series of educational lectures. Selection may be made from one or several of our 40 lesson courses; a chapter may select Lessons 2 and 8 from one course, Lesson 15 from another, and so on. Since each lesson is planned as a separate entity, they may be picked out at random from their normal sequence to provide the type of subject matter specifically desired. Such an educational series of lectures may consist of three to five sessions, each based on a separate lesson.

Many chapters experience difficulty in securing qualified speakers on certain subjects; the M.E.I. lesson courses can correct this deficiency by providing the information to enable the average speaker to become a qualified speaker.

When the preparation of the 40 courses nears completion, a listing of their contents will be put into catalog form and made available to the A.S.M. chapters. The educational committees may study them and then request an examination of those which seem desirable.

The M.E.I. lessons average more than 10,000 words each, and one of these is more than ample in providing the basis for a 1 hr. lecture. Discussion at the conclusion of the talks can be stimulated by providing a series of pertinent questions. We hope to supply such handouts, plus other material that may seem desirable and helpful, as we gain experience in this educational venture.

Tells How Quality Control Is Used to Advantage in Large Automotive Plant

Speaker: H. P. Barringer
Ford Motor Co.

Hazen P. Barringer, assistant manager of quality control of the Ford Steel Division—Ford Motor Co., spoke at a meeting of the **Canton-Massillon Chapter** on the subject "Quality Control as Applied to the Ford Steel Division, Ford Motor Co."

The methods of quality control used at the Ford Steel Division are essentially those used in industry. However, since the products of the mill are expressly for use in the manufacture of automotive products, methods used are tailor-made to suit the Ford operations.

Quality control begins at Ford with the receipt of the customer's order. The contact department investigates all new parts and supplies the mill metallurgist with pertinent information. A standard procedure, taking into account control of raw materials, openhearth production, chemistry, pit practice, temperature control, croppage, conditioning and other information, is selected for processing.

Iron ore and coke are analyzed chemically prior to charging in the blast furnace. Samples of coke are physically tested by ASTM tests. Sinter, made at the Ford's sintering plant, is analyzed chemically in the laboratory. Samples from the blast furnace and from the slag are regularly analyzed as an aid to furnace control. An analysis of each cast from each blast furnace is charted, and is used as a guide in furnace or burden adjustment.

In the openhearth furnaces, chemical analyses of molten iron, scrap and fluxes give the necessary information to produce heats of quality steel and minimize delays. Raw materials are inspected prior to use and analyzed where necessary to meet order requirements. Samples are taken when the bath becomes molten and analyzed so that adjustments may be made during the working of the heat. A final sample is taken to give information on ladle additions to be made. Before the heat is tapped the bath temperature is determined with an immersion thermocouple so it can be tapped within the specified temperature range.

By controlling the pouring heights, the ingot yield at the mill is controlled, enabling the obtaining of slabs or blooms of specified dimensions. A metallurgical observer who has followed the heat at the openhearth supervises pouring and sees that proper deoxidizing practice is followed. Charts pointing out pit practice and rejects are used to measure quality and performance and to show where improvement is required.

Information supplied by the quality control engineer to the soaking pit observer warns the operator of unusual conditions which may be corrected in the heating or soaking operations. Transit time, from finish pouring to finish charging into the pits, is vital and must be controlled; 1½ to 3 hr. is preferred.

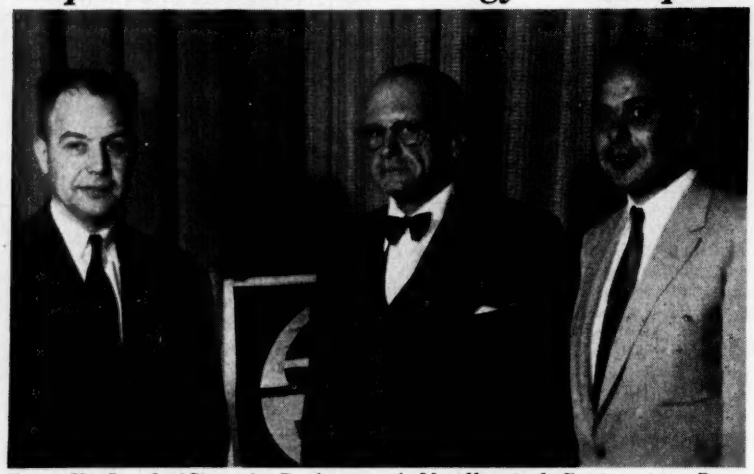
The necessity of bloom conditioning is determined by a mill observer who records the practice in rolling the ingot to the desired size. Blooms are automatically scarfed to a depth of 3/32 in.

Macro-etch, grain size and segregation tests, along with visual inspection, are made on all billets for the 14-in. mill. In addition, Jominy hardenability tests are made on certain types of steel. Billets exhibiting surface defects are hand scarfed. When the billets are rolled into bars, these are chipped if required.

In addition an ultrasonic reflectoscope, magnaflux machine and magnetic comparator are used for testing materials used in the operations. —**Reported by E. S. Rider for Canton-Massillon Chapter.**

distributes annually through chapters and by mail to secondary school students, thousands of leaflets entitled "Does Engineering Appeal to You".

Explains Powder Metallurgy Techniques



Fritz V. Lenel (Center), Professor of Metallurgical Engineering, Rensselaer Polytechnic Institute, Spoke on "Powder Metallurgy — Production and Processing" at a Joint Meeting Held by the Los Angeles Chapters A.S.M. and A.S.T.M. He is shown with James P. Rich (left), technical chairman of the meeting; and J. Dickason (right), program chairman

Speaker: **F. V. Lenel**
Rensselaer Polytechnic Institute

At a meeting of the **Los Angeles Chapter** held jointly with the American Society for Testing Materials, Fritz V. Lenel, professor of metallurgical engineering at Rensselaer Polytechnic Institute, discussed "Powder Metallurgy — Production and Processing".

Comparison of aluminum made by the SAP (sintered aluminum powder) process which was developed by Swiss investigators and aluminum made by the APMP (aluminum powdered metal products) process used by Alcoa were discussed. Methods used in powder preparation, compacting and sintering were presented. Curves showing comparative physical properties were shown and explained.

The outstanding feature of aluminum made by powder metallurgy techniques is its relatively flat creep curves up to testing temperatures of 600° F., and its excellent high-temperature properties in comparison to standard wrought aluminum products. These properties are attributed to the high oxide content which is uniformly distributed in the powder metallurgy material. The high notch sensitivity of the SAP and APMP materials is the limiting factor in the use of these materials.

Another use of powder metals is to make sheet material that normally cannot be fabricated as rolled material using standard production methods. The powder material is fed through special rolls which compact the powder and form it into a sheet. This sheet has very little strength but is subsequently sintered and by a double compacting and sintering operation, satisfactory rolled products can be made.

Dr. Lenel discussed the manufacture of cermets. He explained the use of this type of material for high-temperature turbine blade applications. The fundamental requirement of the material for high-temperature application is to have good high-strength thermal shock and impact resistance as well as resistance to oxidation.

The manufacture of the various carbides and the use of nickel, cobalt and chromium as binder materials were discussed. The titanium carbides have the best high-temperature properties of thermal shock and oxidation resistance. The possibilities for manufacture of turbine blades from cermet materials for use at high temperature are promising.

Attempts are also being made to use the principles of transpiration cooling in producing materials for turbine blades. The permeability of the material has a definite relationship to its transpiration cooling ability. In order to improve the load-carrying ability of the transpiration-cooled materials, a design having a solid core into which cooling grooves were added and a sheath made of a porous material on the outside of the blade were shown.—**Reported by R. D. MacMahon for Los Angeles.**

Annual Conference for Engineers at O. S. U.

The College of Engineering at Ohio State University announces its Annual Conference for Engineers (ACE) to be held in Columbus at the Ohio Union on May 4, 1956. This is an event of interest to practicing engineers in industry, business and public life. Discussions and conferences concerning significant new developments and concepts in the various fields of engineering will be presented by staff members of the College of Engineering and selected industrial personnel. Program announcements will be released shortly.

This 1956 Conference is expected to surpass the record of last year's event which attracted more than 800 engineers from 21 states. Inquiries and reservations should be addressed to: Harold A. Bolz, Associate Dean, College of Engineering, Ohio State University, Columbus 10, Ohio.

At Tri-City National Officers Night

National President A. O. Schaefer, Vice-President, Engineering and Manufacturing, Midvale Co., Spoke on "Application of Emergency Metallurgy to Peacetime Work" at a Meeting of the Tri-City Chapter.. He is shown (center), with Patrick Walseth (left), vice-chairman, and Francis T. McGuire, technical chairman of the meeting. (Reported by R. H. Sholtz for Tri-City)

Cites Factors for Selecting Steels

Porter R. Wray (Center), Assistant Chief Metallurgical Engineer for United States Steel Corp., Presented a Talk Entitled "New Tools for the Selection of Engineering Steels" at a Meeting Which Was Held Recently by the Detroit Chapter. He is shown with two of the officers of the Detroit Chapter

Speaker: Porter R. Wray
U. S. Steel Corp.

Members of the **Detroit Chapter** heard Porter R. Wray, assistant chief metallurgical engineer, U. S. Steel Corp., discuss "New Tools for the Selection of Engineering Steels".

Mr. Wray compared the published mechanical property charts of 15 years ago to the presently available data by which steels can be selected on the basis of their hardenability expectancy. He gave an example of the method of selecting possible steels to meet the requirements of a specific application, showing those factors which can be predicted and listing those factors which require judgment and experience on the part of the materials engineer.

He referred to the work of Janitzky and others which shows that all steels, if quenched to martensite and tempered, exhibit (within relatively narrow limits) the same relationship between tensile strength and hardness, yield strength, elongation, reduction of area and Izod impact. He referred to some recent work which showed the effects of nonmartensitic constituents on these same relationships. Apparently a microstructure containing 80% martensite, balance ferrite or bainite, is only slightly inferior to one which contains 100% martensite.

The data of Hodge and Orehoski which show the relationship between as-quenched hardness, percent martensite and percent carbon are available to determine the *minimum* carbon content to satisfy the strength requirements.

The published A.I.S.I. hardenability bands give hardness both as a function of distance from the quenched end of the hardenability bar and as a function of the section size and location within the quenched bar.

Mr. Wray pointed out that several guides to steel selection are available in military specifications MIL-S-11415 A and MIL-S-16974 D, and in a forthcoming ASTM publication. It is apparent that the guides will be extremely helpful, but will not provide all the answers. According to Mr. Wray, there will still be a job for competent materials engineers.

Selecting steels can best be done by teamwork between the design engineer and materials engineer, keeping in mind the relation of properties to microstructures. The design engineer and materials engineer establish the required strength level for a given part, first considering the types of stresses, whether static or dynamic, reviewing the design to minimize stress raisers, and considering the degree of toughness necessary. Knowing the strength level and the toughness required, the materials engineer can make use of the available "tools" to select a group of steels which, when properly heat treated, could develop the required strength.

Although a preliminary choice of a group of steels to satisfy a given application may be made on the basis of hardenability and mechanical property expectancy, the decision as to which steel is best resides in the proper evaluation of quench cracking tendencies, processing factors and price. This approach to steel selection is "dollar metallurgy", a term coined by L. A. Danse to indicate that the best steel for any job is the least expensive one which will meet both technical and shop requirements.—**Reported by D. V. Doane for Detroit Chapter.**

Honeycomb Brazing Subject at Phoenix Meeting

Speaker: F. J. Filippi
Solar Aircraft Co.

The **Phoenix Area Chapter** heard a talk entitled "Honeycomb Sandwich Brazing" presented by Frank J. Filippi of the research division, Solar Aircraft Co.

With the aid of slides, Mr. Filippi showed how the strength-to-weight ratio in structural parts might well revolutionize future aircraft construction.—**Reported by Don A. Rich for Phoenix Area Chapter.**

At Jersey's Annual Christmas Party

Over 1000 Chapter Members and Their Friends Enjoyed an Entertaining Evening of Good Fellowship at the New Jersey Chapter's Annual Christmas Party. Shown are, from left: A. A. Scafati, chairman of the arrangements committee; and R. A. Grange, chapter chairman. (Reported by K. B. Baker)

Los Angeles Chapter Honors 25-Year Members

Old Timers, Who Have Been A.S.M. Members for 25 Years or More, Were Honored at a Meeting of the Los Angeles Chapter During Which John Russell, Repubic Steel Corp., Presented a Talk on the "Heat Treatment and Properties of Alloy Steels". Past chairmen of the Chapter were also honored

Typhoon Reconnaissance By Air Force Subject at Rocky Mountain-Denver

Speaker: W. C. McGlothlin, Jr.
U. S. Air Force

Major William C. McGlothlin, Jr., director of physical training at the U. S. Air Force Academy, presented a talk on "Typhoon Reconnaissance" at a meeting of the **Rocky Mountain Chapter** at Denver.

The topic of typhoon reconnaissance has attained nation-wide prominence as a result of the recent disasters sustained by the eastern seaboard. Major McGlothlin introduced his subject by explaining the function and interest of the Air Force in studying this type of weather disturbance on a world-wide basis for Air Force, combat and civilian information. He described his personal experiences while flying weather reconnaissance for three years with the First Air Force Reconnaissance Squadron out of Guam. An Air Force film was presented to illustrate the methods used to study typhoons and to adequately describe the jolts and sensations experienced when flying into these storms.

Major McGlothlin gave a detailed account of the techniques used to follow the career of a typhoon from the time when it is first discovered until it has diminished to mild intensity. He explained the necessity of flying directly into the "eye" for purposes of pin-pointing the exact location and obtaining meteorological data by means of electronic instrumentation. He emphasized the extreme severity of flight conditions encountered when penetrating a typhoon, and pointed out that he had great respect for the materials and design that went into the construction of the B-29 aircraft used for these missions.—**Reported by F. C. Perkins for Rocky Mountain.**

Describes Properties of Super Alloys

Stewart Magee, U. S. Steel Corp., Standing, Is Shown Introducing Sustaining Members to the Washington Chapter. Guest speaker, Hiram Brown, Solar Aircraft Co., is shown seated, second from the left of Mr. Magee

Speaker: Hiram Brown
Solar Aircraft Co.

Hiram Brown, chief metallurgist, Solar Aircraft Co., discussed **"Fabricating Properties of High-Temperature Alloys"** at the **Sustaining Members meeting in Washington.**

Mr. Brown stated that metallurgists have kept pace with the present trend of using adjectives like "colossal" and "gigantic" by applying the term "super alloys" to many high-temperature alloys. These materials include stainless steels and other alloys containing high percentages of chromium, nickel, cobalt, molybdenum, tungsten, etc.

The very characteristics which make "super alloys" suitable for applications requiring heat and corrosion resistance are quite often the cause of fabricating difficulties and each group of alloys has its individual pecularities.

Mr. Brown discussed and illustrated with slides such defects as slivers and laminations, and, in addition, the effects of coarse grain, grain boundary carbide networks, zinc contamination, hot shortness and carbon pickup.

Laboratory tests on the "super alloys" must be carefully performed if consistent results are to be obtained. Some alloys show higher elongation with slower testing speeds than with higher speeds. In some cases it was found that failure of an alloy to meet minimum elongation requirements was due to improper procedures in preparing test specimens. Due to notch sensitivity and rapid work hardening, specimens of some materials must be made slightly oversize and then ground and polished to final dimensions.

Mr. Brown also stated that some of the "super alloys" are more sensitive to the presence of inclusions or stringers than is stainless steel.—**Reported by H. P. Weinberg for Washington Chapter.**

Meet Your Chapter Chairman

INDIANAPOLIS

WAYNE H. GLOVER was born at Veedersburg, Ind., in 1925. He graduated from Covington High School in 1941, and from Purdue in 1944 with a B.S. degree in metallurgical engineering. In 1946-47 he took a year of graduate work at Purdue in metallurgy and mechanics. As an undergraduate, Wayne was a member of Triangle Fraternity, business manager of the Purdue engineering magazine, a member of the University choir and an associate member of Sigma Xi.

Wayne, who is vice-president in charge of engineering at Indiana Gear Works Inc., worked as an assistant metallurgist for Servel Inc. after his graduation. He was later employed at Purdue as an instructor in materials testing. He moved to the Indiana Gear Works as chief metallurgist in 1947, was promoted to chief engineer in 1950, and late this year received the promotion to the position he now holds.

Wayne is married and has one daughter, one and a half years old. He is a member of several social and professional organizations. He has served as chairman of the educational, arrangements and program committees for the Indianapolis Chapter. Wayne's principal hobby is music, for which he finds outlet in the Maennerchor of Athenaeum Turners.

OAK RIDGE

W. J. FRETAGUE, metallurgist at Oak Ridge National Laboratory of Union Carbide Nuclear Co., received his B.S. and M.S. degrees in metallurgy from the University of Notre Dame, where he played varsity football in 1940. His experience includes both production and research metallurgy as well as a teaching fellowship. He is a member of A.I.M.E., an associate member of R.E.S.A., and has served as treasurer and vice-chairman of the Oak Ridge Chapter.

Joe is a native of Springfield, Ohio, is married, and has three children. His active participation in outdoor sports in the east Tennessee area includes hunting for bear, boar, deer and turkey, shooting quail, dove and grouse, and fishing for lake trout, bass and muskie.

NEW JERSEY

RAYMOND A. GRANGE is a native of Darlington, Wis. Following completion of schooling in that city, he attended the University of Wisconsin. Immediately after graduation, Ray was employed by U. S. Steel Corp. and has continued his career entirely with that company. First assigned to the metallurgical laboratory at the Chicago South Works, he was subsequently transferred to his present work at the Research Laboratories at Kearny, N. J.

The father of two children, Ray uses his leisure time in enjoyment of his hobbies and other interests, having a special liking for gardening.

Mr. Grange has been a member of his chapter's executive committee for over six years. In his many committee and officership assignments, he has contributed much to the successful activities of his chapter.

GOLDEN GATE

M. VICTOR WALBERG, president of Viking Forge & Steel Co., was born in Fullerton, Calif. He attended University of California, where he was active in water polo and swimming. Intermediate jobs held before his present position include manager of stainless steel department and vice-president of a steel and forge company.

Vic is married and has two children. He likes to play golf and to fish. He graduated from the Engineering Midshipman's School and the New London Submarine School during the war and served over three years throughout the submarine organization, mostly on active duty in the Pacific Theater.

ST. LOUIS

JULIUS TURK, process control supervisor of the Emerson Electric Manufacturing Co., Armament Division, was born in Joliet, Ill., educated in Joliet public schools, Joliet Junior College and the University of Illinois. First employment was as a metallurgical observer at the Gary Steel Mills and he held intermediate positions as instructor, plant metallurgist, and assistant process control supervisor before joining Emerson.

Mr. Turk is married. Services in A.S.M. include member of executive committee, secretary and vice chairman. His hobbies include golf, fishing and music.

CHICAGO—STUDENT CHAPTER

PETER DOWBOR was born in Warsaw, Poland, and attended high school in France and Brazil. At present he is a senior metallurgical engineering student at the Illinois Institute of Technology. He is active in wrestling, soccer, swimming and the International Club, of which he is president.

Before coming to Illinois Tech, Pete worked in a metallurgical laboratory in Moulerade, Brazil. During the summer he works at Precision Methods and Machine Co. in Waterbury, Conn.

ROCKY MOUNTAIN DENVER

FRED E. BLAIR is a native of Colorado and a graduate of the University of Colorado. He was interested in intramural sports while attending college. His first job out of school was as a machinist, and he is presently with the Blair Engineering Co.

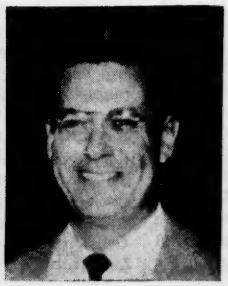
Fred is married and has two children. He is a member of the Colorado Society of Engineers, and has served on several of his A.S.M. Chapter's committees. He likes golf, fishing and bowling.

WESTERN ONTARIO

FRANK MILLER was born in Banot, Roumania. He had four years of technical schooling and started working as an apprentice tool and die maker. He is now president and general manager of the Steel Master Tool Co. Ltd., and is the owner and founder of this company.

Frank and his wife have three children, two girls and a boy. He is a member of several civic, social and technical societies. Frank likes hunting, golfing and fishing.

R. A. Grange *Julius Turk* *W. H. Glover* *M. V. Walberg* *W. J. Fretague*



At Presentation Ceremony in Turin, Italy

Present at a Ceremony in Turin, Italy, During Which the Losana Gold Medal of the Associazone Italiana di Metallurgia Was Awarded to W. Hume-Rothery at a Post-Joint Metallurgical Societies Congress Meeting Were, From Left: John Chipman and Prof. Chaudron, Former Losana Metal Winners; Prof. Hume-Rothery; Senor Anselmetti, Director General, Nazionale Gogne, Turin; Senor Dacco, Who Was Presented an Honorary Membership in A.S.M., and National President (1954-55) George A. Roberts, Who Made the Presentation

Effect of Fatigue on Properties of Metals Subject at Carolinas

Speaker: J. R. Townsend
Sandia Corp.

J. R. Townsend, director of materials and standards engineering, Sandia Corp., spoke on "Fatigue and Its Effects on Mechanical and Metallurgical Properties" at a meeting held by the **Carolinas Chapter.**

Fatigue is not a single discrete property of matter, but a statistical effect which is the result of a number of causes. In the early days of fatigue investigations, the S-N diagrams created an erroneous concept of defining allowable stresses by means of a single curve. Actually, the large spread in experimental results caused by various environmental factors is best defined by an envelope, or series of curves, from which the designer selects the safe stress for design.

Some of the new environments which have been investigated with respect to their effect on fatigue or endurance limit are the effect of high nuclear flux intensities, the effect of combined thermal shock and mechanical stress and the effect of the thermal barrier.

Fundamental investigations conducted by the speaker on the failure of lead cable sheath disclosed that, at certain critical rates of stress variation, a migration of the copper and antimony constituents in the lead alloy takes place, and these constituents become concentrated in the intergranular material at the grain boundaries. Fatigue cracks which form in the metal run through the widened grain boundaries which contain the precipitated material. It was interesting to note that the precipitation of intergranular material did not occur at high rates of stress variation. These studies indicated that maximum endurance limits could be obtained by limiting impurities, eliminating nonmetallic inclusions and controlling grain size.

The fatigue characteristics of sheet nonferrous metals were also discussed, and it was stated that a sheet exhibited a higher endurance limit when stressed transversely to the direction of rolling as compared with that obtained when stressed parallel to the direction of rolling. In this connection, the development of relay springs to withstand in excess of one billion operations was briefly related. The problem was solved by utilizing carefully selected homogeneous metal in the form of a wire, processed to avoid and eliminate internal or trapped stresses.

Because fatigue occurs with "stuff" in general, failures in polyethylene cable sheath and vulcanized telephone plug shells were also discussed. It was pointed out that practically all plastics are particularly susceptible to impact fatigue failure.—**Reported by Joseph Koresh for Carolinas.**

Presents History of the Development of Aluminum

Speaker: G. M. Young
Aluminum Co. of Canada, Ltd.

At a meeting of the **Ottawa Valley Chapter,** G. M. Young, technical director of the Aluminum Co. of Canada, Ltd., delivered a most interesting talk on the "History of Aluminum Alloy Development".

Mr. Young outlined the discovery of aluminum by Oerstead and the "chemical" aluminum industry developed by St. Claire Deville. The resourcefulness and foresight of the early workers were also outlined.

The experiments of Hall and Heroult leading to the development of the electrolytic process and modern commercial aluminum were described, as were the early alloys which have, in general, now become obsolete or modified almost beyond recognition.

Mr. Young also discussed in detail the development of the modern wrought, cast and heat treated alloys. By use of slides he showed the effects of various alloying elements, and the alloys developed within the main groups such as Al-Cu, Al-Si, Al-Mg and Al-Zn.

Mr. Young discussed the future of aluminum and the meeting was closed with a very interesting question and answer period.—**Reported by John O. Edwards for the Ottawa Valley Chapter.**

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Engineers Week—Pres. Eisenhower has proclaimed the week of Feb. 19 as Engineers Week in honor of all engineers who point up the contributions of the engineering profession to the American way of life and standard of living.

Building Program—A $5-million building program has been announced which will give Armour Research Foundation one of the most complete industrial research centers in the world. Included will be a physics, electrical engineering research building and a chemistry research building, and additions will be made to the mechanical engineering and the metals research buildings.

Add Rolling Equipment—Titanium Metals Corp. of America has placed an order for a Sendzimir reversing cluster mill for the cold rolling of continuous bands of titanium sheet up to 49 in. wide. This is the first step in the development of a specialized fabricating facility devoted to the rolling and forging of titanium at the company.

Plan Expansion—A $16-million expansion program for 1956 is underway by Air Reduction Sales Co., a move that points up the confidence Air Reduction has in the anticipated increased use of industrial gases in the future.

Invite Papers—The National Program Committee of the American Society of Tool Engineers is extending invitations for technical papers to be presented at the 25th Annual Convention to be held in April 1957. Information may be obtained from: L. S. Fletcher, Program Director, A.S.T.E., 10700 Puritan Ave., Detroit 38, Mich.

Metals Institute—The School of Mechanical Engineering at Oklahoma A.&M. College is sponsoring the second annual Metals Institute, to be held at the college May 7 and 8, 1956. The Institute will feature nationally known specialists in the field of metallurgy who will speak on technical phases of this subject.

To Build—The R-S Furnace Co., Inc., of Philadelphia, has been awarded a contract to build two aluminum plate solution heat treating furnaces for the Davenport Works of the Aluminum Co. of America under a prime contract with the U. S. Air Force. The furnaces will be the largest of their kind and are expected to go into operation late in 1956.

Lincoln Award—The James F. Lincoln Arc Welding Foundation of Cleveland is offering $2000 in cash awards for ideas or suggestions that will accelerate progress in arc welding. Write for information to: The Foundation, Cleveland 17, Ohio.

Expands—Holcroft & Co., engineers and manufacturers of heat treating equipment, has announced the expansion of its plant and office facilities. Purchase of adjacent property gives the plant 16,000 sq. ft. of additional floor space.

Die Casting Award—The American Die Casting Institute announces that its annual Doehler Award for outstanding contributions to the advancement of the die casting process is now open and nominations for the award or supporting papers or other material will be received until Apr. 15 by the Awards Committee, American Die Casting Institute, 366 Madison Ave., New York 17, N Y.

Junior Engineers—An organization, Junior Engineering for Technical Schools (JETS), originated by Michigan State University, is doing in engineering what the 4-H and Future Farmers of America clubs long have done in agriculture, and with amazing results. The JETS is bringing the facts of engineering to a growing number of young people and may definitely boost America's race with Russia for trained engineers. The program includes 75 clubs in 18 states, with an active membership of more than 2000 boys and girls.

Contracts Granted—Government contracts have been awarded to Horizons Inc., government and industrial research organization, for work in the fields of barium titanate and titanium hydride formation, for the Air Force and the Navy, respectively. Tien-Shih Liu, A.S.M., will head the work on titanium hydride formation.

New Battery—A revolutionary new battery, combining the weight and size advantage of a silver-zinc couple, with the long life characteristics of a nickel-cadmium couple, has been developed by Yardney Electric Corp. The battery substitutes silver for nickel in conjunction with a newly developed cadmium plate. Long life, high capacity, low weight and reduced size result.

Technical Papers Invited for A.S.M. Transactions

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1957 *Transactions* and possible presentation before a national meeting of the Society. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the Society.

Many of the papers approved by the Committee will be scheduled for presentation on the technical program of the 38th National Metal Congress and Exposition to be held in Cleveland Oct. 8-12, 1956. All papers that are accepted will be preprinted. Manuscripts should be received at A.S.M. headquarters office not later than April 2, 1956.

Acceptance of a paper for publication does not necessarily infer that it will be presented at the annual convention. The selection of approved papers for the convention program will be made early in June.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Should it be your intention to submit a paper, please notify A.S.M. A copy of the booklet entitled "Suggestions to Authors in the Preparation of Technical Papers" will be gladly forwarded. This booklet may help considerably in the preparation of line drawings and illustrations.

Discusses Residual Stress Analysis

Dayton Members Heard a Talk on "Applied Residual Stress Analysis" Recently. Shown, from left: R. L. Mattson, General Motors Research Laboratories, speaker; Louis McBride, vice-chairman; and H. Reindl, chairman

Speaker: R. L. Mattson
General Motors Research Labs

Raymond L. Mattson, assistant head of the engineering mechanics department, General Motors Research Laboratories, spoke before the **Dayton Chapter** on the subject "Applied Residual Stress Analysis".

Mr. Mattson stated that more cooperation is needed between the engineer and the metallurgist in solving residual stress problems. Many times in design the assumption is made that the residual stresses are zero; however, it should be realized that every processing operation performed can induce residual stresses, such as machining, grinding, heat treating, etc. If the kind of the induced stress obtained by the various processing treatments is known, in many cases their advantages can be utilized.

A model of a load stress versus residual stress analyzer was demonstrated and an example of the effective induced residual stresses resulting from a straightening operation shown. Mr. Mattson said that heating relieves these induced stresses by lowering the yield point of the material; however, no appreciable benefit is usually obtained until a temperature of approximately 800° F. is reached.

A series of case histories involving various fatigue failures were reviewed by a series of slides. These included illustrations of fatigue failures on ball bearings and on gear teeth resulting from grinding burns. Examples of increasing fatigue life on leaf springs were discussed. It was shown that the effective compressive residual stresses induced by peening were in relationship to the peening time and the type of material which was being processed.

Graphs illustrating a comparison of the residual stresses at various case depths in hardened carburized gears were also shown. It was noted that the maximum peak in the compressive stress resulted at the case-core boundary. As the tempering temperature increases, a decrease of these surface compressive stresses toward zero results.

A comparison of induced compressive stresses by various heat treatments was given. These included carburizing, carbonitriding, and cyaniding. In all instances the maximum condition of the induced compressive stresses resulted at the case-core boundary. The depth of this induced stress was in relationship to the depth of the case treatment.—**Reported by Walter J. Ridd for Dayton.**

Junior Section Hears Discussion on Corrosion

Speaker: R. M. Fuller
International Nickel Co., Inc.

At a recent meeting of the **Junior Section of the Philadelphia Chapter,** Robert M. Fuller, of the Corrosion Section, International Nickel Co., Inc., presented a film produced by his company and entitled "Corrosion in Action".

The film depicted the many discoveries made in the field of corrosion during the past half-century, such as the generally accepted electrochemical theory of corrosion and galvanic corrosion.

Corrosion is a complex phenomenon which may take one or more of several forms. The fundamental corrosion reaction involves the corrosion of metal atoms to ions at areas called anodes. Electrons, which are released in this reaction, migrate to more electropositive areas called cathodes, where they reduce hydrogen ions, oxygen, or other ions in the corroding solution.

The rate of corrosion is influenced by many factors, including the acidity of the solution, oxidizing agents present, velocity or agitation, films or inhibitors.

With the knowledge of what causes corrosion and what factors influence or limit it, man has been able to cope with nature either by adjusting the environment to protect the existing equipment or by developing new alloys to combat the corrosion.

At the conclusion of the film, Mr. Fuller discussed the corrosion problem briefly and answered questions that were raised by the film.—**Reported by W. L. Hunsberger for the Philadelphia Juniors.**

Joins Metal Progress Staff

Donald J. Walter, for the past three years copy and program director for F. B. Hubert, Advertising Counselors, Detroit, has been appointed district manager in the Detroit area for *Metal Progress,* engineering monthly of the metalworking industry, published by A.S.M.

Donald J. Walter

Don comes to the advertising department of *Metal Progress* with practical experience in both sales and creative advertising, having worked with many important industrial accounts on market analysis, media purchases, copy and the development of complete packaging programs for merchandising and sales.

The new district manager was former advertising manager for Goddard and Goddard Co., Detroit, manufacturers of standard and special milling cutters.

Don is a graduate of Otterbein College and Castle Heights Military Academy.

has fathered the establishment of *Acta Metallurgica,* technical and theoretical international publication for the entire metals industry.

Atoms and Atomic Energy Described at Meeting in Quebec

Speaker: P. E. Gagnon
Laval University

At a meeting of **Quebec Chapter**, P. E. Gagnon, head of the chemistry department and dean of graduate students, Laval University, gave a talk on "Atoms and Atomic Energy".

Dr. Gagnon stated that three-quarters of today's research problems have as their basis atomic reactions, their application and regulated control. The number of discoveries about atoms today are without parallel in history; 13 new species of atoms have been discovered since 1937 and two new ones have yet to be discovered. Dr. Gagnon predicted that the atom will soon become as fascinating for popular studies as the camera and the automobile.

Dr. Gagnon outlined the distribution of atoms in the crust of the earth, 75 types of atoms representing only 0.41% of the total number of atoms in the earth. Some of these types of atoms were briefly discussed and their outstanding properties given. The "dissection" of the atoms into their nucleus and electron components was then made and these particles described. The relative size of these particles and of the empty space surrounding them was illustrated by the statement that if the hydrogen atom was magnified two million billion times the nucleus would be the size of a pinhead and the electron would be 62 miles away from its nucleus. These electrons may be caused to leave the atom by light or heat and applications of these processes are seen in the "electric eye", radio tube, etc.

The nucleus was also analyzed into its component particles—neutrons and protons, etc., and the particles defined. The protons are positively charged particles and were shown to be capable of being knocked out of the nuclei in 1919 by Rutherford. The neutrons, being uncharged particles, are more difficult to detect and control and were only discovered in 1936 by Chadwick. Free neutrons are obtained only by nuclear reactions.

Isotopes contain different numbers of neutrons and thus have a slightly different atomic weight, although they have the same atomic number.

Radio-active atoms disintegrate spontaneously to produce new species. For example, radium will give radon, helium and gamma rays. Rutherford made the first artificial transmutation of one atom to another by bombarding a nitrogren nucleus with artificially accelerated particles.

Sometime later Fermi reasoned that neutrons, having no charge, should be capable of entering nuclei without retardation by a coulomb repulsive force and be most efficient agents of nuclear transmutation. Experiments have since confirmed this, as practically all nuclei can be transmuted by neutron bombardment.

Other modes of nuclear disintegration were yet to be found. In 1939, Niels Bohr had evidence that absorption of neutron by the uranium nucleus could cause it to split approximately in two. The phenonenon has been called nuclear fission and uranium has since been split into barium and krypton or into antimony and columbium. Since neutrons are also produced during fission a chain reaction is thus possible.

Still another development of a nuclear reaction is that of the fusion reaction. In this case protons and neutrons are "fused" to give a helium atom and release an extremely large quantity of atomic energy.

Finally, the Canadian heavy water reactor in Chalk River was described. It has the highest neutron flux in the world and is used to produce radio-active isotopes for medical, industrial and research purposes.

Dr. Gagnon concluded with general cosmological remarks about the sun's atomic reactions and the age of the universe.—**Reported by H. P. Tardif for Quebec Chapter.**

Presents Properties of Super Alloys

A. E. Bowden, Left, Vice-Chairman, Is Shown With F. M. Richmond, Universal Cyclops Steel Corp., at a Meeting Held in Montreal. Mr. Richmond spoke on the "Heat Treatment, Properties and Applications of Super Alloys"

Speaker: F. M. Richmond
Universal Cyclops Steel Corp.

Frank M. Richmond, research associate, Universal Cyclops Steel Corp., guest speaker at a meeting of the **Montreal Chapter,** spoke on the "Heat Treatment, Properties and Applications of Super Alloys". Super alloys, Mr. Richmond stated, cover materials having high strength, corrosion resistance and other desirable properties at elevated temperatures up to 1600° F. and beyond. The classifications of austenitic, refractory and synthetic alloys were outlined and their characteristics discussed. Applications involving such materials as the Nimonics, the Hastelloys, 17W, Vitallium, M252, S816, 17-7PH and Waspaloy were shown.

Attention was drawn to two aspects of the problem, which is basically that of retaining the desired properties at a maximum under the influence of constant high temperature or more frequently temperatures varying from ambient to high. The first aspect is the continuing development of primary constituents and alloying elements to improve properties. Examples of this are the use of molybdenum and tungsten in increasing percentages, and the addition of small quantities of titanium and aluminum. The second aspect concerns the melting and processing of the alloys, where new or improved techniques result in better properties. Vacuum melting in particular has resulted in greatly increased high-temperature properties in these alloys.

Mr. Richmond pointed out that service temperatures are rapidly increasing, especially in the aircraft field, and that the design limits are largely based on the limitations of materials. A wide field is open to the metallurgist and engineer in reducing or removing these limitations. —**Reported by Rafe Sherwin for Montreal Chapter.**

Points Out Properties of Alloy Steels

At at Meeting Held by the Los Angeles Chapter, H. E. Pellett, Left, Technical Chairman, Is Shown With Speaker John Russell, Republic Steel Corp.

Speaker: J. V. Russell
Republic Steel Corp.

Many pertinent factors involved in correlating laboratory test results with serviceability of parts made of heat treated alloy steels were brought out at a meeting of the **Los Angeles Chapter,** by John Russell, metallurgical laboratory director, Republic Steel Corp., South Chicago Works, in a talk entitled "Heat Treatment and Mechanical Properties of Alloy Steels".

Laboratory results on test specimens must be properly interpreted in order to intelligently apply them to complicated geometric sections, Mr. Russell pointed out.

Plastic flow is caused only by shear stress while brittle failures and fatigue failures can always be regarded as due to tensile stress. Although it is not usually described in this way, Mr. Russell stated that the shear strength can be considered as the yield strength or the point at which plastic flow commences.

During his talk, Mr. Russell showed many informative colored slides which illustrated the application of uni-axial, bi-axial, and tri-axial stresses as imposed during tensile bar testing. He also showed informative charts illustrating the correlation between longitudinal and transverse properties and the way in which they are affected by heat treatment and composition.

Considerable data accumulated in the Republic Steel laboratories were presented to show that some alloys, heat treated to high strength levels, may have lower than normal ductility, especially when tested in a transverse direction.—**Reported by R. D. MacMahon for Los Angeles.**

Fort Wayne Hears Talk on Induction Heating Methods

Speaker: J. F. Libsch
Lehigh University

Joseph F. Libsch, professor of metallurgy at Lehigh University and consulting metallurgist at Lepel High Frequency Laboratories, Inc., spoke on "Induction Heating" at a meeting held recently by the **Fort Wayne Chapter.**

Dr. Libsch described induction heating as being the extremely rapid heating of material by means of induced energy from high-frequency, alternating current. Any material that is an electrical conductor can be so heated. When a work-piece is exposed to a rapidly alternating magnetic field created by a coil carrying high frequency, alternating electrical current, circulating currents are developed within the piece, and the electrical resistance of the material in resisting these currents generates heat.

In explaining the metallurgical aspects dealing with this manner of heating, it was mentioned that no new metallurgical terms need be coined, as all of these metallurgical reactions are explainable with basic metallurgical principles. For this reason, induction heating can be used for hardening, tempering and for brazing.

Dr. Libsch stated that in hardening, the prior structure is important and that the most desirable structure is a quenched and tempered structure, although a normalized structure is usually satisfactory. Hot rolled structures are suitable if minimum case depth is not required. He then stated that an induction hardened surface is usually harder than a furnace hardened surface, due to less retained austenite, residual stresses and carbon gradients in the austenite at the time of quenching with the induction heating. The depth of heat penetration is affected by the frequency of the alternating current and the power available.

The usual steels that are induction hardened are the plain carbon steels in the range of 0.35 to 0.50% C, although alloy steels can be so treated. Alloy steels containing no carbide forming elements, such as chromium, tungsten, molybdenum and vanadium, may be handled much the same as plain carbon steels. However, those steels that do contain carbide forming elements can be induction heated with special consideration.

The advantages of induction heating are that pieces can be selectively hardened or tempered. Material can be case hardened, leaving a ductile core, by this method.

In comparing induction versus furnace tempering, Dr. Libsch stated that pieces processed by each method will have comparable physical properties, and a similar degree of stress relief, as long as both pieces are treated to the same hardness, higher temperatures compensating for shorter times. In induction heating, the piece is held for zero time at temperature, whereas furnace heating requires a soak time.

Ductile iron can be successfully induction surface hardened from a quenched and tempered structure to provide a good balance of properties. Generally speaking, induction heating is not recommended for high speed steels as their hardening temperatures are close to their melting points; also, they contain carbide forming elements which render them difficult to process.

Dr. Libsch statistically authenticated his remarks with a generous use of charts and graphs.—**Reported by J. P. Crosbie for Fort Wayne.**

Speaks in Milwaukee on The Copper-Base Alloys

Speaker: L. E. Gibbs
Revere Copper and Brass, Inc.

"Metallurgy and Applications of Copper-Base Alloys" was the topic presented by L. E. Gibbs, manager of technical service, Revere Copper and Brass, Inc. at a recent meeting held by the **Milwaukee Chapter.**

Mr. Gibbs described the various alloys presently in use with examples of their commercial applications. He grouped the alloys into five classes: coppers, brasses, phosphor bronzes, aluminum bronzes and silicon bronzes, and cupronickels.

A movie was also shown which told the story of the construction of the aluminum manufacturing center at Kitimat, B. C.—**Reported by P. W. Ramsey for Milwaukee Chapter.**

Presents Talk on Brittle Fracture

From Left: W. S. Pellini, of the Metallurgical Division, Naval Research Laboratory, Who Spoke on "Brittle Fracture—Cause and Prevention", Is Shown Being Congratulated by Oak Ridge Technical Chairman, R. J. Gray

Speaker: W. S. Pellini
Naval Research Laboratory

Members of the **Oak Ridge Chapter** A.S.M. and the Knoxville Chapter of the American Welding Society heard W. S. Pellini at a joint dinner meeting held recently in Knoxville. Mr. Pellini, who is superintendent of the metallurgy division at the Naval Research Laboratory, spoke on "Brittle Fracture—Cause and Prevention".

Mr. Pellini reported on the extensive studies since the beginning of World War II on the problem of the brittle fracture of large welded structures.

The first signs of difficulty actually occurred during the late 30's with the failures of certain welded bridges and storage tanks for liquefied gases. During World War II a large number of welded ships suffered failure and, as the result, extensive investigations were started.

The problem of the brittle fracture of large welded structures may be traced to the presence of sharp, crack-like notches, in or near welds, and the use of steels of inadequate notch ductility. Attention to design and fabrication procedures may greatly alleviate the probem; however, a certain solution may be found only by improving the notch ductility of the steel.

Mr. Pellini proceeded to illustrate the behavior of various types of steels in the presence of sharp, crack-like notches. In order to duplicate the service condition of ultra-sharp cracks, a brittle weld is used which cracks on loading of the base steel thus subjecting it to a test in the presence of a sharp crack. Two types of tests are used—the drop weight test which determines the temperature of nil ductility and the explosion crack-starter test which indicates the highest temperature of possible fracture propagation. It is more difficult to start a brittle fracture than to stop it once it has started. Because of this it is necessary to define two critical temperatures of transition: (1) the ductility transition temperature (for initiation); and (2) the fracture transition temperature (for propagation).

The actual temperatures of the two critical transitions vary greatly with the type of steel. For example, ship plate steel of the type used for the construction of the World War II ships usually has a ductility transition of 20 to 40° F. and a fracture transition of 60 to 80° F. Certain quenched and tempered steels may have the same transitions, as low as −100 and −150°F., respectively.

It was demonstrated also that the Charpy V test could be used to predict the ductility and fracture transition temperatures of the steels.

Slides presented by the speaker effectively illustrated the definite transition in a series of tests at intervals of temperature and summarized graphically the results of tests on a wide variety of different compositions and heat treatments of materials.

Knowledge of the transition temperatures and factors controlling them enable the design engineer to select the proper material with an eye toward notch ductility as an important criterion.—**Reported by W. O. Harms for Oak Ridge.**

Heat Treatment Advances Discussed

Shown at a Joint Meeting of Worcester and Springfield Chapters Are, From Left: H. D. Berry and L. G. Shaw, Chairman and Vice-Chairman, Worcester Chapter; Howard E. Boyer, Chief Metallurgist, American Bosch Arma Corp. and Past Chairman, Springfield Chapter, Who Spoke on "Recent Developments in Heat Treatment"; C. S. Leonard and L. B. Howard, Past Chairman and Chairman of the Springfield Chapter. (Photograph by C. Weston Russell)

Speaker: H. E. Boyer
American Bosch Arma Corp.

Howard E. Boyer, chief metallurgist, American Bosch Division, American Bosch Arma Corp., addressed a joint meeting of **Worcester** and **Springfield Chapters** in Springfield. The subject of his talk was "Recent Developments in Heat Treatment".

Mr. Boyer's discussion took up such subjects as carburizing and nitriding. He described the closed-cycle furnace and emphasized that carbon is the most important element in steel, from a heat treatment standpoint. A variation in the carbon content usually calls for a different heat treatment.

Mr. Boyer showed a series of slides which gave the audience an opportunity to observe the possible heat treatment of a number of types of steel, depending, of course, on the qualities desired. Knowledge of the chemical analysis of a piece of steel, which somewhat classifies it, is one of the initial steps in deciding on the subsequent heat treatment, which is also governed to a degree by what properties the buyer of the heat treated product most desires.

Mr. Boyer described changes which take place in the steel when different heat treatments are applied, dwelling on alterations in the austenite among others. The speaker made his talk as basic and simple as possible in order to reach the largest number in the audience.—**Reported by C. W. Russell for Worcester Chapter.**

Present at 2200-Lb. Vacuum Furnace Opening

A. S. M. Members Who Were on Hand at Vacuum Metals Corp.'s Press Conference in Syracuse on Dec. 8 for the Opening of the New 2200-Lb. Vacuum Furnace, the Largest Now in Production, Included, Front, From Left: A. H. Lewis, Sales Manager, and A. M. Aksoy, Chief Metallurgist, Vacuum Metals Corp.; Walter H. Wiewel, President, Vacuum Metals Corp. and Senior Vice-President, Crucible Steel Co. of America; and C. A. Wheeler, Supervisor of Sales, Vacuum Metals Corp. Back row, from left: A. E. Franks, plant superintendent, Vacuum Metals Corp.; A. E. March, chief metallurgist, Sanderson-Halcomb Works, Crucible Steel Co.; J. H. Moore, general manager, Vacuum Metals Corp.; L. L. Ferrall, vice-president production, Crucible Steel Co.; and D. I. Dilworth, chief, metallurgy department, Crucible Steel Co.

Describes New Technique Of Metal Part Forming

Speaker: J. N. Heater

Cincinnati Milling Machine Co.

John N. Heater, Cincinnati Milling Machine Co., discussed a "New Technique of Metal Part Formation" at a meeting held in **Cincinnati.**

Mr. Heater explained that hydrospinning is not new in concept, just a new application of an old art. The present process is a development inspired by the early pottery trades, which came into being because of the requirements of new industries, such as the jet engine, television, and guided missile.

These new industries have components which are common to all; that is, they have tubes which are cylindrical in shape and must be accurate within a few thousandths of an inch with a good commercial finish. Until the development of the hydrospinning process, the manufacture of these parts was expensive, wasteful and laborious.

Briefly, the hydrospinning process is one of forming a flat hollow disk on a mandrel by using rollers which are under extreme pressure. When power is applied, the rollers move along the mandrel causing the metal to flow plastically on the mandrel until the desired form is produced. Shapes can be produced which are other than conical in nature, such as tubular and elliptical, but all, by nature of the process, must be symmetrical about an axis. Surprisingly long and large parts can be formed by this process without intermittent annealing. Finish dimensions, finish and wall thickness are extremely accurate and true.

Structurally the metal has the appearance of being severely cold worked with the expected increase in tensile strength, yield strength and a slight decrease in ductility. Where intricate parts must be formed or accurate ductility is needed, parts are formed almost complete, then annealed, and finally formed with only a small reduction.—**Reported by Al Strohmenger for Cincinnati Chapter.**

Calumet Members Hear Talk on Impact Forging

Speaker: C. K. David

Ladish Co.

Members of the **Calumet Chapter** heard C. K. David, metallurgist, Ladish Co., speak on "Modern Impact Forging", at a recent meeting.

Mr. David described impact forging as a method of producing a useful metal shape by the repeated application of sudden pressure, exerted by expending all of the energy of a mechanically propelled or freely falling mass in a very short interval of time. This method is in direct contrast to press forging in the manner in which the pressure is applied. During the press forging operation the pressure builds up gradually to a maximum.

Mr. David described the design and operation of the three types of drop hammers commonly used in industry today. The first two types are gravity drop hammers, the board and Ceco drop hammers, which utilize the free falling mass principle, and the third type is the steam drop using steam pressure to increase the ram velocity exerting a much harder blow per pound of falling ram weight than possible with the gravity drop hammer.

The speaker pointed out that, metallurgically, hot working of metal by impact forging improves the material which has been refined by rolling or pressing, by forming it into a desired shape, further refining the grain, sealing any remaining voids, and providing fiber formation or the alignment of the grain structure parallel to the contour of the part.

The mechanical properties, particularly transverse ductility, of a metal formed in closed dies on the drop hammer are superior to those of the same material as cast or formed on a press. The superior properties are a result of forging in closed dies under conditions of great restraint and extremely high impact pressures. —**Reported by T. W. Howlett for Calumet Chapter.**

publishes *Transactions*, a bound volume containing the papers and discussions presented at the annual convention, together with reports of the activities of the Society.

Philadelphia Features Tool and Die Steel Talk

Speaker: S. G. Fletcher
Latrobe Steel Co.

Stewart G. Fletcher, director of metallurgy, Latrobe Steel Co., spoke to the **Philadelphia Chapter** on "Tool and Die Steels".

The general context of the talk was on new developments in tool and die steels, and Dr. Fletcher covered three phases; the first, new compositions and alloys; the second, heat treatment and new equipment; and lastly, toolsteel making and quality control.

In regard to new compositions and alloys, Dr. Fletcher pointed out that the free machining types are gaining recognition. Formerly, these toolsteels were only a small portion of the over-all output. The machinability is improved primarily by the addition of sulphides, but until recently the use of these additions was frowned upon by many of the toolsteel producers and consumers.

The ever-increasing demands for better surface finishes have been overcome by two modifications of old practices. The first method is to semi-harden the toolsteel to approximately RC-45, to machine, re-anneal and then to give the material the final heat treatment. This method is considered undesirable, however, because of the extra operations involved. The new method of adding sulphides to the steel has proved to be much more effective and is now considered more acceptable.

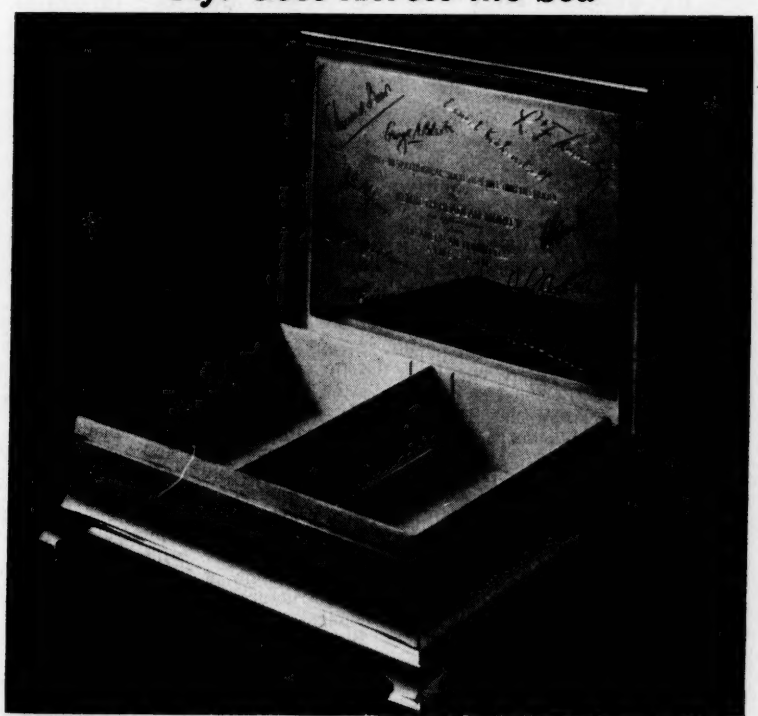
The addition of vanadium to the high-carbon, high-chromium steels has increased the usefulness of these alloys. Vanadium carbides attain a hardness of RC 83 to 85.

A die steel for hot working applications is produced by the addition of 4% nickel and 1½% aluminum. The Fe-Ni-Al alloy can be precipitation hardened up to BHN 350 with uniform hardness throughout and with no distortion. At this hardness the material is somewhat notch sensitive and is not recommended for shock loading applications.

The second phase of new developments covered the heat treatment of tool and die steels. Mr. Fletcher pointed out that the methods and techniques of heat treating have improved partially through the efforts of the A.S.M. in educating industry. The appearance of new and improved equipment such as salt baths, new atmosphere furnaces and improved pyrometric techniques has helped tremendously in increasing the properties of the tools by heat treatment. These methods have enabled the manufacturer to obtain good size control and predict the final size of finished tools and dies.

The last phase of Mr. Fletcher's talk was on the advancements made in the art of making toolsteels. Improvements have followed because of the use of more severe testing methods and more rigid inspection. These include the use of the spectrometer where 8 elements can be recorded in 15 to 20 min., giving a close check on the melt before it is poured. Another testing method is ultrasonic testing for internal defects. Such defects as porosity and carbide segregation can be detected. The presence of segregated carbides results in stress concentrations, which lower the impact strength. New melting methods which tend to reduce carbide segregation and to produce cleaner, more uniform steels have resulted in increased toolsteel quality. Vacuum melting of toolsteels was mentioned briefly, but no results of the effect of vacuum melting are yet available.—**Reported by G. Krauss and L. F. Calzi for Philadelphia.**

Gift Goes Across the Sea



Cigarette Box Presented to Kenneth Headlam-Morley by the American Committee for His Work in Organizing the Joint Metallurgical Societies Meeting Held in Europe Last Summer. Mr. Headlam-Morley, secretary of the British Iron and Steel Institute, was honorary general secretary of the Joint Metallurgical Societies Meeting. Signatures of the American Committee, representing A.S.M. and the American Institute of Mining and Metallurgical Engineers, are J. B. Austin and L. F. Reinartz, co-chairmen; Ernest Kirkendall, secretary; George A. Roberts, John Chipman, Howard Biers, R. S. Archer, John J. Golden, Clyde Williams and William H. Eisenman

Joint Talks on Nonferrous-Ferrous Metal in North Texas

Speakers: E. Spuhler
Frank D. Weaver

At a meeting of the **North Texas Chapter** Ed Spuhler, service engineer, Aluminum Co. of America, spoke on "Nonferrous Metals" and Frank D. Weaver, director of research, Dresser Industries Inc., spoke on "Ferrrous Metals".

Mr. Spuhler's talk covered fatigue testing and the status of new developments in equipment and products of interest to the aircraft industry.

Mr. Weaver's talk covered materials used in the oil drilling industry and their applications.—**Reported by R. E. Hopper for North Texas.**

New Films

The Allen Story

A 25-min. color film shows the development and application of threaded fastenings from their earliest use in Greek and Roman times right up to the present. The film shows early manufacturing methods and how these have been refined into today's high precision threading.

The film is available on free loan from the advertising department, Allen Mfg. Co., Hartford 2, Conn.

Machining Characteristics Discussed

J. F. Kahles and M. Field, Metcut Research Associates, Discussed "Machining of Stainless Steels, Super Alloys and Titanium" at a New Jersey Meeting.. At the head table were, from left: R. A. Grange, chairman; Dr. Kahles; W. C. Schulte, technical chairman; Dr. Field; and J. Maranchik, of Metcut

Speakers: John F. Kahles
Michael Field
Metcut Research Associates

The **New Jersey Chapter** enjoyed a lecture by John F. Kahles and Michael Field of Metcut Research Associates on the "Machining of Stainless Steel, Super Alloys and Titanium".

Dr. Kahles defined machinability as a measure of the tool life, surface finish and power requirements obtained in machining. Of these three factors, tool life is the most important and is measured in Metcut's laboratory by observing the wear land developed on the clearance side of the tool as the machining progresses.

There are many factors which promote tool wear, such as affinity of the work being machined to the tool material, high cutting tool-work temperatures, abrasiveness and work hardening of material machined.

With stainless steel, the presence of ferrite is conducive to better machinability. Spheroidization can, in some cases, be an aid to good machinability. The trend today in industry is to control the microstructure to in turn control the uniformity of machining any given material. This can be done by proper thermal treatment.

The problems of machining titanium were discussed. One of the chief factors making titanium difficult to machine is the fact that titanium seizes or has an affinity to any other material which is used for the tool. Alloying titanium reduces its machinability, and, in general, when machining titanium, higher temperatures are reached than in machining steels. There is a definite need for some new tool material for machining titanium which would be antigalling.

Dr. Field went into a discussion of the super alloys and how they perform as to machinability. The disk alloys, such as Timken 16-25-6 and Discalloy, machined somewhat poorer than the stainless steels. Alloy titanium machined in a manner similar to the disk alloys. The turbine bucket alloys such as S-816, Inconel-X, and Nimonic 80 were still poorer in machinability.

It was pointed out that improvement in machinability can be effected by solution treating of high-temperature alloys. Likewise, it was mentioned that the selection of the tool material is very important. Carbide tools, in general, give better machinability than high speed steel tools. The cast iron grades of sintered carbides give longer tool life than the steel cutting grades of carbide. On many high-temperature alloys, the machinability is so poor that grinding has to be resorted to for removing metal effectively.

The lecture was drawn to a conclusion by showing slides of different applications where the machining of titanium or other super alloys for jet engine parts was performed and how they were handled. It was pointed out that the broaching of titanium is difficult, and that, in general, only the surface had been scratched with respect to the solving of all the problems concerning machinability of stainless steel, super alloys and titanium. Individual problems have to be worked out on the production line rather than attempting to develop a blanket or general solution which would fit every problem. Each case is an individual problem and has to be so handled.

There was exhibited after the lecture several difficult machining jobs which the speakers had worked on for the purpose of improving tool life during machining.—**Reported by John B. Bursley for New Jersey.**

Gives Talk in Cincinnati On Defects in Metals

Speaker: David Turnbull
General Electric Co.

David Turnbull, manager of the chemical metallurgical section, metallurgical and ceramics department, Research Laboratory, General Electric Co., spoke on "Defects in Metals" at a meeting in **Cincinnati.**

The perfect crystal theory of metals explained satisfactorily the equilibrium properties of metals, such as the elastic constants, melting point, etc. However, many of the important metallurgical properties, such as yield stress, fracturing, rates of age hardening, etc., can not be understood on the basis of this theory.

Dr. Turnbull, with actual visual aids, explained that metals have low strength because of irregularities in the crystal lattice. In many experiments it has been substantially proven that etch pits locate the position of dislocations in metals. Eventually the talk progressed into the formation of the perfect crystal and techniques involved. Testing proves the perfect crystal theory within experimental error.

As a conclusion, Dr. Turnbull showed movies of the formation of perfect crystals in aqueous solutions and the catastrophes which occur to make these crystals imperfect, such as collision with other crystals, dirt particles, etc.

The coffee talk, "A Quick Look at Moscow", given by Bill Weisel, was a rare treat. Bill was one of the nine ex-GI's who had a reunion this past summer in Moscow with the Russian soldiers that his patrol met at the Elbe River, near the end of the war in Europe.—**Reported by Al Strohmenger for Cincinnati.**

OBITUARIES

James McElgin

JAMES MCELGIN, manager of the metalworking department, E. F. Houghton & Co., died suddenly while on business in Chicago in December. Mr. McElgin, 54, had been employed by Houghton since 1924. He was a 25-year member of A.S.M., and a member of the Philadelphia Chapter.

Nicholas T. Belaiew

COLONEL N. T. BELAIEW died in Paris on Nov. 5, 1955. Born in Russia in 1879, he graduated from the Michael Artillery Academy, St. Petersburg, in 1904 and was assigned to the teaching staff where he came into intimate contact with Tschernoff, then professor of physical metallurgy. Under Tschernoff's inspiration, Belaiew began his brilliant work on crystallization of steel, Widmanstatten structure and microstructure of ancient irons and steels. Early in World War I he was sent to England as a member of the Russian War Supply Committee; he never returned to Russia. Settling in Paris shortly after the war, he joined the faculty of the Welding Institute (Institut de Soudure Autogene) and served as consultant to many metallurgical firms.

Harold W. Faint

HAROLD W. FAINT, western sales manager for the metal finishing division, Frederic B. Stevens, Inc., died suddenly of a heart attack late in December. Mr. Faint was a member of the Chicago Chapter.

Hear Panel Discuss Salvage of Worn Parts

Members of Jacksonville Chapter Formed an Interested Audience When a Panel of Experts Discussed "Salvage of Worn Parts" at a Recent Meeting. A tour of Liddy's Machine Shop completed the evening

A symposium on "Salvage of Worn Parts" was held by the **Jacksonville Chapter** recently. Speakers for the evening were Robert K. Guffie, United Chromium Division, Metal & Thermit Corp.; R. T. Phillips, Haynes Stellite Co.; E. P. Kelley, Philadelphia; E. W. Connolly, Haynes Stellite Co.; and Emil J. Dalbo, Metallizing Engineering Co. Inc.

Mr. Guffie's topic was "Hard Chromium Plating" and he discussed its method of application and advantages. Details and recommended thicknesses were given on the chromium plating of plug and thread gages, drills, taps, reamers and cutting tools. Another typical use in which chromium excels, Mr. Guffie stated, is for cylinders, drums and forming tools where chromium's high hardness and low coefficient of friction are desired. An unusual example of this is the molds used in casting the glass face of television tubes and the extension of their service life by hard chromium plating.

Mr. Phillips spoke on "Welding and Hard Facing", a method of fusing special alloys, in the form of welding rods, to the surfaces of metal parts. A wide selection of alloys is available and the choice depends upon the type of wear encountered. In almost every case, service life of worn parts is increased many times that of the original or new part when the proper alloy is selected. Slides were shown demonstrating typical uses and applications of hard facing alloys. Advantages of hard facing are the wide range of alloys available and that standard welding equipment can be used.

Mr. Dalbo showed a film demonstrating the application and usage of Metco equipment. Metallizing can be done with any metal available in a wire form. With aluminum and zinc, corrosion protection of large structures is possible.—**Reported by B. W. Boisvert for Jacksonville.**

Cincinnati-Columbus-Dayton Chapters Set Up Tri-Chapter Meeting

The 18th Annual Tri-Chapter Meeting of the Columbus, Dayton and Cincinnati Chapters of the American Society for Metals has been scheduled for Wednesday, Apr. 4, 1956, in Columbus. The location is set for the Westinghouse Electric Corp. plant, but in the event the present strike is not settled the meeting will be moved to the General Motors Plant, Ternstedt Division.

The tentative program for the meeting, to operate under the theme, "Metallurgy—Today and Tomorrow", is as follows:

9:30 a. m.—Registration, at Westinghouse Plant (or General Motors)

Future Developments in Iron and Steel, by M. W. Lightner, assistant vice-president, research and technology, U. S. Steel Corp.

Future Developments in Light Metals Field, by S. F. Radtke, director, metallurgical research laboratories, Reynolds Metals Co.

Future in Copper-Base Alloys, by Roy S. Pratt, technical director, Bridgeport Brass Co.

Luncheon at the location of the meeting.

Titanium, by T. W. Lippert, manager, technical sales and service, Titanium Metals Corp.

Future Development in High-Temperature Metals, by J. W. Freeman, Engineering Research Institute, University of Michigan

Metallurgical Aspects of Atomic Energy, by D. W. Lillie, General Electric Research Laboratory

A dinner, featuring a talk on "Technical Manpower", by Gordon B. Carson, College of Engineering, Ohio State University, will be held at the Everglades Night Club, and will wind up the activities of the meeting.

IMPORTANT MEETINGS
for March

Mar. 13—Cleveland Engineering Society. 13th Annual Machine Design Conference, Cleveland Engineering Society Headquarters, Cleveland, Ohio. (C.E.S., 2136 East 19th St., Cleveland 15, Ohio)

Mar. 5-6—Instrument Society of America. Sixth Conference on Instrumentation for the Iron and Steel Industry, Hotel Webster Hall, Pittsburgh. (Fred Marton, Secretary, Pittsburgh Section, I.S.A., 845 Ridge Ave., Pittsburgh 12, Pa.)

Mar. 12-16—National Association of Corrosion Engineers. 12th Annual Corrosion Conference, Hotel Statler, New York City. (A. B. Campbell, Executive Secretary, N.A.C.E., 1061 M & M Bldg., Houston 2, Tex.).

Mar. 14-16—Pressed Metal Institute. Annual Spring Technical Meeting, Hotel Carter, Cleveland, Ohio. (H. A. Daschner, Managing Director, P.M.I., 3673 Lee Rd., Cleveland 20, Ohio)

Mar. 19-21—American Institute of Mining and Metallurgical Engineers. Regional Reactive Metals Conference, Hotel Statler, Buffalo, N. Y. (Ernest Kirkendall, Secretary, A.I.M.E., 29 West 39th St., New York 18, N. Y.)

Mar. 19-23—American Society of Tool Engineers. Industrial Exposition and 24th Annual Convention, International Amphitheater, Chicago. (Harry E. Conrad, Executive Secretary, A.S.T.E., 10700 Puritan Ave., Detroit 21, Mich.)

Mar. 21-23—Illinois Institute of Technology. 18th Annual American Power Conference, Hotel Sherman, Chicago. (Stewart S. Howe, Public Relations Director, I.I.T., 35 West 33rd St., Chicago 16, Ill.)

Ⓜ has an annual budget in excess of one million dollars.

Titanium Talks Presented in Northwest

Frank H. Vandenburgh (Right), Spoke on "Titanium" at Separate Meetings Held by the Columbia Basin and Oregon Chapters. He is shown with R. B. Switters (Left), Columbia Basin, and G. H. Denny, Mallory-Sharon Corp.

Speaker: F. H. Vandenburgh
Mallory Sharon Titanium Corp.

At separate meetings of the **Columbia Basin** and **Oregon Chapters,** Frank H. Vandenburgh, Mallory Sharon Titanium Corp., presented a talk on "Titanium".

Titanium, he pointed out, is similar in many respects to zirconium. This similarity enabled the titanium manufacturers to adapt the double-melt batch process used for zirconium to the melting of titanium sponge on a commercial basis. The titanium sponge is prepared for melting by the magnesium chloride reduction method.

The production rate of titanium is rising steadily, so that instead of the few tons produced in 1950 or the 10,000 tons expected in 1955, the production rate by 1960 should exceed 35,000 tons. This production rate is being subsidized by the government as a necessary means of developing sufficient sources for future heavy demands expected by the military establishments, particularly the Air Force, once basic research and development work now underway on means of forming and joining titanium is completed.

Mr. Vandenburgh showed, by means of graphs, that titanium is superior to half-hard 18-8 stainless steel on a strength-to-weight basis up to a temperature of 800° F. As aluminum loses strength rapidly above a temperature of 350° F., it is being replaced by titanium for aircraft structural members where high temperatures are encountered. The corrosion resistance of titanium in salt water and marine atmospheres is unexcelled and it is equally resistant to many acids and alkalis.

The principal uses for titanium are in aircraft airframes and power plants, marine applications, ordnance uses and in chemical and food processing equipment.—**Reported by W. S. Kelly for the Columbia Basin Chapter and the Oregon Chapter.**

Speaks in Hartford on Protective Metal Coatings

Speaker: Ivor E. Campbell
Battelle Memorial Institute

Members of the **Hartford Chapter** heard Ivor E. Campbell, chief of the inorganic chemistry and chemical engineering division, Battelle Memorial Institute, present a talk on "Protective Coatings for Metals".

Dr. Campbell's talk was concerned mainly with the vapor deposition and the preparation of high-purity metals, particularly those of a refractory nature.

Slides illustrating the properties of the various coatings obtainable as well as their microstructures were shown. Schematic diagrams of some of the apparatus used in the vapor deposition process were also presented.—**Reported by Gordon W. Hunt for Hartford.**

Metallic Coatings Topic at Montreal

C. H. Sample, Right, International Nickel Co., Inc., Spoke on "Corrosion Behavior and Protective Value of Electrodeposited Metallic Coatings" at a Meeting in Montreal. He is shown with Chapter chairman J. J. Waller

Speaker: C. H. Sample
International Nickel Co., Inc.

At a meeting of the **Montreal Chapter,** Clarence H. Sample of the Electroplating Section, Development and Research Division, International Nickel Co., Inc., gave a talk on "Corrosion Behavior and the Protective Value of Electrodeposited Metallic Coatings."

Mr. Sample discussed the value of the accelerated corrosion test by laboratory salt spray as against corrosion resulting from actual atmospheric environments. The salt spray test may often give erroneous results unless comparative data are available between known test results and known results on service parts.

Slides were shown of laboratory test pieces and other samples located near the sea shore and in industrial atmospheres. An example was shown where the salt spray test had proven cadmium plating superior to zinc plating; this was contradicted when fresh sea water was used in the salt spray cabinet, but corroborated near the sea shore and again contradicted in an industrial atmosphere.

Mr. Sample reviewed decorative plating of the copper-nickel-chromium type, such as is used on automobiles. Colored slides were shown which compared the corrosion behavior of such coatings under different service conditions. Test results illustrated the difference in behavior of chromium-on-nickel-on-copper with varying thicknesses of copper and nickel, and also chromium on single nickel coatings and on double nickel coatings. Division of opinion exists whether copper would be dropped altogether if there were enough nickel, or whether copper would be retained in any event.—**Reported by Rafe Sherwin for the Montreal Chapter.**

Reports on Titanium and Its Alloys

Robert Nycum, Left, Assistant Manager of Sales, Titanium Metals Corp. of America, Is Shown Being Congratulated by J. J. Penkoske, Chairman of Northeast Pennsylvania Chapter. Mr. Nycum gave a talk on "Titanium"

Speaker: Robert Nycum

Titanium Metals Corp. of America

Robert Nycum, assistant manager of sales, Titanium Metals Corp. of America, addressed the **Northeast Pennsylvania Chapter** on the "Production and Application of Titanium and Its Alloys".

The speaker outlined the history of the discovery and development of titanium. Since 1946, when Dr. Kroll developed the first practical commercial method of extracting the metal from its ores, the titanium metal industry has grown to become a $60,000,000 a year industry.

The principal advantages of titanium are its excellent corrosion resistance, its favorable strength-to-weight ratio and its abundance. Known reserves of titanium ore exceed the known and used reserves of all the other nonferrous metals combined. Titanium's greatest disadvantage is its cost, which stands at approximately $8 to $10 per lb. in the billet form.

The principal titanium ores are illmenite and rutile, of which the former is the more plentiful and the latter the more valuable, being 97% titanium oxide. Because of this higher quality, rutile is the principal source of titanium raw material and is found in the seacoast sands of Australia and the United States.

Titanium sponge is produced at the Henderson, Nev., plant of Titanium Metals Corp. by the Knoll process. The sponge is formed into electrodes and double melted in vacuum in water-cooled copper crucibles to form the refined ingots. After surface conditioning these ingots are hot worked on conventional equipment into standard rolled, drawn and extruded shapes. By proper alloying the tensile strength of titanium is being raised from 70,000 to 150,000 psi.

Mr. Nycum stated that the present major markets for the "wonder metal" are tied in with aircraft, more specifically, jet engine compressor parts and airframes. However, many other possible applications are simply awaiting an ample supply of the metal.—**Reported by A. J. Babecki for Northeast Pennsylvania Chapter.**

Form Nuclear Activities Council in Pittsburgh Area

The Pittsburgh Nuclear Activities Council, made up of representatives of 16 technical societies active in the area, has been organized to coordinate the activities of the member societies in the field of nuclear science and technology. At the organizational meeting, the Council elected E. B. Gunyou, of the American Institute of Chemical Engineers, president, and S. B. Gunst, of the Physical Society of Pittsburgh, secretary-treasurer.

Purpose of the Nuclear Activities Council is to act as a central agency to keep abreast of developments in nuclear science and technology and to assist in the development of this field in the area. To accomplish this, the Council will coordinate the activities of member societies, investigate the needs for industrial training courses, inventory the area's industrial and institutional facilities for nuclear research, and provide a central nuclear information agency. The Council will also sponsor a series of lecture courses.

Societies not yet officially represented are invited to contact Thomas E. Stelson, Civil Engineering Department, Carnegie Institute of Technology, to arrange for participation.

Chicago Members Tour Ryerson Plant

As Part of the Educational Series on "What Steel Shall I Use" Sponsored by the Chicago Chapter, 150 Members and Others Who Attended the Lectures, Toured the Steel Service Plant of Joseph T. Ryerson & Son, Inc., as Guests of the Plant. Spark tester Stanley Orlowski is shown demonstrating to a few members of the group the spark testing method of identifying steels

As a part of its educational series of lectures on the subject, "What Steel Shall I Use?" the Chicago Chapter sponsored a trip to the steel service plant of Joseph T. Ryerson & Son, Inc., Chicago. One hundred and fifty members, and others attending the lectures, were guests of the company at dinner in its cafeteria. The two-hour tour of the plant followed.

During their trip through the plant, the visitors had an opportunity to see practically every kind and shape of steel that is rolled, in carbon, alloy and stainless types. Of particular interest to them were the methods employed in maintaining the quality of Ryerson steels, especially the rigid controls exercised in specifying, testing, identifying and furnishing hardenability information covering the alloys. The Ryerson certified alloy steel plan, an eight-step quality program adopted in 1937, is said to be the most far reaching of any in the industry for eliminating uncertainty in the purchase and use of alloy steels.

Tells Steel Wire Story at Syracuse

R. R. Tatnall, Wickwire Spencer Division, Colorado Fuel and Iron Corp., Spoke on the "Story of Steel Wire" at a Meeting of the Syracuse Chapter. Shown are, from left: J. A. Miskelly, vice-chairman; E. A. March, education committee; R. R. Tatnall; F. Hunter, chairman; W. Knight, coffee speaker; M. D. Coughenour, entertainment committee; W. Hodap, past chairman; and J. O. Oschner, secretary: (Photograph by D. B. Blackwood)

Speaker: R. R. Tatnall

Colorado Fuel and Iron Corp.

Rodman R. Tatnall, field service metallurgist of the Wickwire Spencer Division, Colorado Fuel and Iron Corp., presented a talk on the "Story of Steel Wire" at a recent meeting of the **Syracuse Chapter.**

Mr. Tatnall's talk covered the manufacturing processes of the wire industry and the most important metallurgical contributions to their development and growth.

A comparison of the product of the early wire mills to the precision wires of today was presented in order to stress the tremendous strides which have been made in the industry in the past 75 years.

The major stimultants to the infant wire industry, according to Mr. Tatnall, were the inventions of the telegraph and the telephone. The need for wire in these fields greatly increased the production effort in wire mills.

Gaining importance as production increased were the physical and mechanical aspects involved in wire and die material selection, in die design and in production economics.

Ferrous compositions fabricated in wire form today range from the low carbon steels of low strength to the specialized high carbon steels of high strength. With the aid of a series of slides, Mr. Tatnall showed representative microstructures to point out that the end product in the wire mill is determined by the interrelationship of chemical analysis, heat treatment and cold work.

Originally the chill cast iron die was used in wire drawing. Although changes in die material have progressed through the years from the cast iron die to the present-day tungsten carbide dies, the mechanical configuration of the die has not changed. The mechanical principle involved in wire drawing, therefore, is substantially unchanged from that of early times and the growth of the wire industry can be attributed directly to metallurgical contributions.

With the introduction of the tungsten carbide die in the 1930's, the economics in wire drawing began to be measured not by the size and the weight of wire drawn, but by the number of feet of wire taken through a die before it became excessively worn.

This progress gives a metal or an alloy in the wire form a versatility and economy that no other material approaches.—**Reported by L. Zakraysek for Syracuse Chapter.**

Compliments

To FELIX E. WORMSER, assistant secretary of the Department of Interior, on being named the 1956 recipient of the Egleston Medal, Columbia University's highest award for "distinguished engineering achievement". Mr. Wormser has been an A.S.M. member since 1944.

♦ ♦ ♦

To MAX HANSEN on being elected president of the Deutsche Gesellschaft fur Metallkunde for the three-year period 1956 to 1958. Dr. Hansen was formerly manager of the metals research department of Armour Research Foundation and since his return to Germany in 1955 has been vice-president, Metallgesellschaft.

♦ ♦ ♦

To the Electrochemical Society on establishing the F. M. Becket Memorial Award. The award is in the form of an annual scholarship aimed at interesting college students in the field of high-temperature electric furnace operations. Dr. Becket, a graduate of McGill University, received a M.A. degree from Columbia University in 1902. He was one of the founders of the Niagara Research Laboratories and joined Electro Metallurgical Co. and Union Carbide Co. in 1906, subsequently becoming president of the Union Carbide and Carbon Research Laboratories and vice-president of Union Carbide Co., Electro Metallurgical Co. and Haynes Stellite Co. Dr. Becket was a pioneer in the production of low carbon ferro-alloys and was the inventor of most of the silicon reduction methods now employed. He made many contributions to the art of ore dressing and to the metallurgy of steel alloys before his death in 1942.

On Experts' Panel at Western Ontario

A Panel of Experts Parried Audience Questions Back and Forth in a Lively Stump-the-Experts Night Meeting Held by the Western Ontario Chapter. Members of the panel included, from left: Alexander Stewart, Essex Welder's Supplies; Woodleigh Turner, Dominion Forge Ltd., Who Was Also Technical Chairman of the Meeting; Henry Shepherd, Border Tool and Die; Harry Grunther, Ford Motor Co. of Canada; and Bob Stewart, Vanadium-Alloys Steel, Canada. (Reported by R. V. Hutchinson for Western Ontario)

Student Members'

PLACEMENT SERVICE

Listed on the following pages are the qualifications of student members of the American Society for Metals who are graduating (or who are candidates for advanced degrees) in the field of metallurgy. Most of these men will be available between now and next summer. They are grouped according to the school attended, on the pages indicated by the table of contents below. The name of the head of the department of metallurgy at the school, and in most instances, the name of the faculty member in charge of student placement, is indicated. Further information about any of these graduates may be secured from the head of the department or by writing to the student direct.

UNIVERSITY OF ALABAMA 27
University, Ala.
E. C. Wright, Head, Department of Metallurgical Engineering; W. D. McIlvaine, Jr., Director of Engineering Extension and Placement

UNIVERSITY OF ARIZONA 27
Tucson, Ariz.
J. B. Cunningham, Department of Metallurgy, College of Mines; Victor H. Kelley, Placement Director

CARNEGIE INSTITUTE OF TECHNOLOGY 28
Schenley Park, Pittsburgh 13, Pa.
Robert F. Mehl, Head, Department of Metallurgical Engineering; C. E. Wangeman, Head of Bureau of Placement

CASE INSTITUTE OF TECHNOLOGY 28
10900 Euclid Ave., Cleveland 6, Ohio
A. R. Troiano, Head, Department of Metallurgical Engineering; Arthur E. Bach, Manager, Placement and Personnel

UNIVERSITY OF CINCINNATI 27
Cincinnati 21, Ohio
William Licht, Head, Department of Chemical and Metallurgical Engineering; Ralph A. Van Wye, Head of Student Placement

COLORADO SCHOOL OF MINES 28
Golden, Colo.
H. Gordon Poole, Head, Department of Metallurgical Engineering

COLUMBIA UNIVERSITY 29
New York 27, N. Y.
Maxwell Gensamer, Professor of Metallurgy, School of Mines; Mary A. Wegener, Associate Placement Director of Engineering Graduates

DREXEL INSTITUTE OF TECHNOLOGY 30
31st and Chestnut Sts., Philadelphia 4, Pa.
A. W. Grosvenor, Head, Department of Metallurgical Engineering; Robert McMurray, Placement Officer

GEORGIA INSTITUTE OF TECHNOLOGY 29
Atlanta, Ga.
Head, School of Chemical Engineering

GROVE CITY COLLEGE 31
Grove City, Pa.
R. Clark Dawes, Head, Department of Metallurgy; Jack Kennedy, Placement Officer

UNIVERSITY OF KENTUCKY 29
Lexington, Ky.
C. S. Crouse, Head, Department of Mining and Metallurgical Engineering, College of Engineering; Edward E. Elsey, In Charge of Placement

LAFAYETTE COLLEGE 32
Easton, Pa.
L. Donovan Clark, Head, Mining and Metallurgical Engineering Department; F. W. Slantz, Head, Placement Bureau

LAVAL UNIVERSITY 33
Blvd. de l'Etente, Quebec, Canada
G. Letendre, Director, Department of Mining and Metallurgy

LEHIGH UNIVERSITY 33
Bethlehem, Pa.
Allison Butts, Head, Department of Metallurgy; Everett A. Teal, Director of Placement Service

McGILL UNIVERSITY 34
Montreal, Quebec, Canada
J. U. MacEwan, Chairman, Department of Metallurgical Engineering; C. M. McDougall, McGill Placement Service

MASSACHUSETTS INSTITUTE OF TECHNOLOGY 34
Cambridge 39, Mass.
John Chipman, Head, Department of Metallurgy; N. J. Grant, Placement Director, Department of Metallurgy; Philip Stoddard, Placement Director for School

MICHIGAN COLLEGE OF MINING AND TECHNOLOGY 35
Houghton, Mich.
C. T. Eddy, Head, Department of Metallurgical Engineering; L. F. Duggan, Dean of Students and Placement Director

MICHIGAN STATE COLLEGE 31
East Lansing, Mich.
A. J. Smith, Head, Department of Metallurgy; Tom King, Dean of Students and Director of Placement Service

UNIVERSITY OF MINNESOTA 35
Institute of Technology, Minneapolis 14, Minn.
M. E. Nicholson, Head, Department of Metallurgy; D. H. Yardley, Head, Placement for School of Mines and Metallurgy

MISSOURI SCHOOL OF MINES AND METALLURGY 36
Rolla, Mo.
A. W. Schlechten, Chairman, Department of Metallurgical Engineering; V. A. C. Gevecker, Assistant Dean, In Charge of Student Placement

NEW YORK UNIVERSITY 36
University Heights, New York 53, N. Y.
John P. Nielsen, Chairman, Department of Metallurgical Engineering; A. J. Foy Cross, Placement Director

NOTRE DAME UNIVERSITY 37
Notre Dame, Ind.
E. A. Peretti, Head, Department of Metallurgy; Rev. Alfred Mendez, Placement Director

OHIO STATE UNIVERSITY 36
100 Lord Hall, Columbus, Ohio
M. G. Fontana, Head, Department of Metallurgy; Miss Lilyan B. Bradshaw, Placement Director, College of Engineering

PENNSYLVANIA STATE UNIVERSITY 37
University Park, Pa.
A. J. Shaler, Head, Department of Metallurgy College of Mineral Industries; G. N. P. Leetch, Director, College Placement Service

UNIVERSITY OF PITTSBURGH 38
109 State Hall, Pittsburgh, Pa.
J. Alfred Berger, Head, Metallurgical Engineering Department; Paul M. Sherwood, Director of Placement Bureau, Office of the Dean of Men, 809 Cathedral of Learning, Pittsburgh 13, Pa.

POLYTECHNIC INSTITUTE OF BROOKLYN 39
99 Livingston St., Brooklyn 1, N. Y.
M. Balicki, Head, Division of Metallurgical Engineering, Mechanical Engineering Department; John W. Andrews, Placement Director

PURDUE UNIVERSITY 39
Lafayette, Ind.
R. Schuhmann, Jr., Chairman of the Division of Metallurgical Engineering, School of Chemical and Metallurgical Engineering; F. L. Cason, Director, Placement Service, Engineering and Science

QUEEN'S UNIVERSITY 39
Kingston, Ont., Canada
T. V. Lord, Head, Department of Metallurgy; H. J. Hamilton, Manager of Employment Service

RENSSELAER POLYTECHNIC INSTITUTE 40
Troy, N. Y.
Arthur A. Burr, Head, Department of Metallurgical Engineering; Herbert P. Catlin, Head, Student Placement

RYERSON INSTITUTE OF TECHNOLOGY 41
Toronto, Ont., Canada
K. Piekarski, Head, Metallurgical Department; D. Bridge, Director and Placement Officer

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY 40
Rapid City, S. D.
Paul H. Anderson, Head, Department of Metallurgical Engineering; L. R. Palmerton, Director of Student Placement

STANFORD UNIVERSITY 41
Stanford University, Calif.
O. Cutler Shepard, Director, Division of Mineral Technology; Eugene Dils, Director of Placement Service

UNIVERSITY OF TENNESSEE 41
Knoxville, Tenn.
E. E. Stansbury, Professor of Metallurgical Engineering, Metallurgy Division, Chemical Engineering Department; Howard H. Lumsden, Director of the Bureau of Placement

TENNESSEE AGRICULTURAL AND INDUSTRIAL STATE UNIVERSITY 41
Nashville, Tenn.
James A. Parsons, Head, Department of Metallurgical Engineering; W. V. Harper, Placement Director

UNIVERSITY OF UTAH 41
205 Mines Bldg., Salt Lake City 1, Utah
John R. Lewis, Head, Department of Metallurgical Engineering

UNIVERSITY OF WASHINGTON 42
Seattle 5, Wash.
Drury A. Pifer, Director, School of Mineral Engineering; Earl C. Roberts, In Charge of Placement

WASHINGTON STATE COLLEGE 42
Pullman, Wash.
J. P. Spielman, Dean, School of Mines, and Acting Head, Department of Metallurgy; Walter M. Bristol, Director of Placement Bureau

YOUNGSTOWN COLLEGE 42
Youngstown, Ohio
Edward J. Fisher, Head, Department of Metallurgical Engineering; Prof. Cooper, Head of Student Placement

University of Alabama

Gene A. Gorham

Degree Expected: B.S. in Met. Eng.

School Address: Box 2287, University, Ala.
Home Address: 3316 40th Way, N., Birmingham, Ala.

Age 24, married, no children, draft status 1-S-C. Interested in foundry and metallurgical courses in physical metallurgy, metallography. Foundry Educational Foundation Scholarship for seven semesters. Student officer in A.F.S., member A.I.M.E. Served two years as wood-patternmaker's apprentice, as lab assistant in university foundry courses. Interested in any phase of metallurgy. South preferred. Available June.

Richard Lee Hopper

Degree Expected: B.S. in Met. Eng.

School Address: Box 881, University, Ala.
Home Address: Box 206, Heflin, Ala.

Age 28, married, Korean veteran. Required metallurgical engineering courses, B+ average. Holds scholarship from Foundry Educational Foundation, member A.F.S. Interested in production and development of light metals or steel. Desires South. Available August.

Bobby R. Phillips

Degree Expected: B.S. in Met. Eng.

School Address: Box 3438, University, Ala.
Home Address: General Delivery, Falksville, Ala.

Age 26, married, two dependents. Interested in nonferrous and cast iron foundry. General metallurgical courses, member A.F.S. Experience as aviation metalsmith, U.S.N., journeyman sheet metal worker, and in university foundry. Available September.

University of Arizona

Cletis C. Land

Degree Expected: B.S. in Met. Eng.

School Address: S.U.P.O. Box 9052, Tucson, Ariz.
Home Address: Rt. 3, Box 350, Yuma, Ariz.

Age 21, Single, student deferment. Engineering background with emphasis on process metallurgy. A.S.M. and Oliver scholarships. Social and technical societies. Worked with A.E.C. and Bureau of Mines. Prefers work in physical metallurgy, any territory. Plans graduate work in physical metallurgy. Available May.

University of Cincinnati

M. Fawzi Hamad

Degree Expected: Ph.D. in Met.

School Address: 2544 University Court, Cincinnati, Ohio
Home Address: Same.

Age 34, married, four children, Syrian citizen. B. S. degrees in science and mathematics, mechanical engineering, and M.S. in metallurgy. Five years experience as workshop director of Syrian University, two years in welding and metallurgical research, three years as Syrian Government consulting engineer. Four years Syrian Government fellowship. Social, technical organizations. Good background in physics and mathematics. Prefers work in foundry or casting, or as dealer, sales or representative in Middle East. Available June 1.

Dale Martin Kohler

Degree Expected: B.S. in Met. Eng.

School Address: French Hall, U. of C., Cincinnati 21, Ohio
Home Address: 101 Ardmore Drive, Middletown, Ohio

Age 22, single. Courses in chemistry, physics, calculus, thermodynamics, physical chemistry, fluid flow, heat transfer, strength of materials, electroplating, corrosion, forming and fabrication, physical metallurgy, process metallurgy, X-ray diffraction. Social and technical activities. Scholarship, dean's list, four years co-op experience in research, metallography, mechanical testing, product development. Graduate courses in solid state physics and physical chemistry of metals. Prefers research or product development. Available June.

Donald Paul Kohorst

Degree Expected: Met. Eng.

School Address: 4102 Clubview Dr., Cincinnati, Ohio
Home Address: Same.

Age 22, married. Member of ROTC, subject to 6 months to 2 years active duty. Professional experience in high-temperature materials testing, creep and stress rupture, failure analysis, metallography, heat treating. Prefers work in development of materials for aircraft applications. West or Midwest preferred. Available June, subject to draft call.

James Russell Myers

Degree Expected: Met. Eng.

School Address: Box 47, French Hall, Cincinnati 20, Ohio.
Home Address: 719 Charles St., Middletown, Ohio.

Age 22, single, member ROTC. Courses in mathematics through differential equations, physical chemistry, theoretical metallurgy, metallurgical failure analysis, metallurgical operations, corrosion, electroplating, heat transfer, flow of fluids, metallography, writing for publications. A.S.M., Verity scholarships. Social, technical actvities. Experience in research laboratories doing metallography, mechanical testing, service investigations. Prefers ferrous physical metallurgy, graduate fellowship or assistantship, U. S. or Canada. Available June.

Carnegie Institute of Technology Case (Cont.)

Robert W. Redlinger

Degree Expected: B.S. in Met. Eng.

School Address: 2416 Spring St., Pittsburgh 10, Pa.
Home Address: Same.

Age 26, married, veteran. Courses in physical, mechanical and process metallurgy, ferrous and nonferrous metallography, physical chemistry, minors in mechanical and electrical engineering. Student member technical organizations. Summer work in radiography. Thesis on "Evaluation of Residual Stresses in Deep Drawn Couplings". Prefers development or technical sales, Pittsburgh area. Available June.

Robert C. Solbach

Degree Expected: B.S. in Met. Eng.

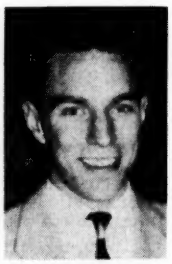
School Address: 3 Elizabeth St., Pittsburgh 10, Pa.
Home Address: Same.

Age 22, single, 1-D status, Army Engineer ROTC. Courses in physical, mechanical and process metallurgy, ferrous and nonferrous metallography, seminar, physical chemistry, minors in mechanical and electrical engineering. Thesis on "Oxidation of Zirconium". Social studies in philosophy, psychology, literature. Member technical and social organizations. Summer work in basic openhearth. Prefers production or sales. Western Pennsylvania preferred but will locate anywhere. Available June.

Richard Wolfe

Degree Expected: B.S. in Met. Eng.

School Address: Carnegie Tech P. O. Box 382, Pittsburgh 13, Pa.
Home Address: 455 Beach, 131 St., Rockaway Park 94, N. Y.



Age 20, single, draft status 2-S. Courses in ferrous and nonferrous metallography, physical, nonferrous and ferrous production metallurgy, mechanical metallurgy, physical chemistry, seminar, thesis, minors in electrical and mechanical engineering, humanistic and social studies. Prefers sales or production in New York, New Jersey or Connecticut. Available June 25.

Case Institute of Technology

Francis J. Klepek

Degree Expected: B.S. in Met. Eng.

School Address: 11116 Magnolia, Cleveland 6, Ohio
Home Address: 526 W. 36th, Ashtabula, Ohio

Age 21, single, draft status 2-S. Usual metallurgical subjects. Active in sports. Prefers production or sales, any territory. Available June.

Mark G. Morris

Degree Expected: B.S. in Met. Eng.

School Address: 2033 Cornell Rd., Cleveland 6, Ohio
Home Address: Same.

Age 22, married, draft status 2-S. Courses in ferrous, nonferrous metallurgy, engineering administration. Social, technical societies, Van Horn scholarship. Experience as research assistant during summer. Available June 15.

James Edward Tripp

Degree Expected: B.S. in Met. Eng.

School Address: 2111 Abington Rd., Cleveland 6, Ohio
Home Address: Swanton St., Metamora, Ohio

Age 22, single, draft status 2-S. Metallurgical engineering subjects, interested in research and development. Social, technical organizations. General scholarship and Foundry Educational Foundation scholarship. Experience as laboratory technician and student trainee in large company. Available in June, but expects to continue graduate study at Case.

Colorado School of Mines

Horacio A. Franco

Degree Expected: Met. Eng.

School Address: 1218 16th St., Golden, Colo.
Home Address: Apart. aereo 977, Barranquilla, Colombia, S. A.

Age 23, single. Courses in hydrometallurgy, flotation, ore dressing operations. Technical societies. Prefers ore dressing operations or any phase of metallurgy, any place in world. Available after June.

David Rees Genth

Degree Expected: Met. Eng.

School Address: 923 18th St., Golden, Colo.
Home Address: 1125 Park Ave., New York 28, N. Y.

Age 24, single, draft status 2-S. Courses in flotation, ore preparation, pyrometallurgy, spectrography, metallography, corrosion, Spanish. No previous professional experience, willing to be trained. Research work in field of extractive metallurgy or in sales of metallurgical equipment preferred, U. S. or abroad. Available June 20.

Colorado (Cont.)

Edward J. Graeber, Jr.

Degree Expected: Met. Eng.

School Address: Alpha Tau Omega, 1107 16th St., Golden, Colo.

Home Address: 4455 Tennyson St., Denver, Colo.

Age 22, married, ROTC, to commence active duty June 1957. Courses in metallurgical, mechanical engineering, mathematics, chemistry, surveying. Social, technical activities. Summer work as heat treater for metal treating and research company, mining work. Prefers research and development concerning atomic reactors, Midwest or Western U. S. Available July 1.

Franklin LaMar King

Degree Expected: Met. Eng.

School Address: 1112½ Washington Ave., Golden, Colo.

Home Address: Same.

Age 25, married, veteran, no reserve status. Major in physical metallurgy. Technical activities. Interested in aluminum fabrication and/or research, Western U. S. Available August.

Gerald Paul Nelson

Degree Expected: Met. Eng.

School Address: 500½ E. 18th St., Golden, Colo.

Home Address: 707 Grand Ave., Emmetsburg, Iowa.

Age 25, single, draft status 1-C, honorable discharge. Majors in metallurgy, chemistry, mathematics, civil engineering. Social activities. No experience. Prefers physical metallurgy, production or development, any location. Available July.

Columbia University

Raphael Bernstein

Degree Expected: B.S. in Met. Eng.

School Address: 500 Riverside Drive, Room 1017, New York 27, N. Y.

Home Address: 4004 Grey Ave., Montreal, Quebec, Canada.

Age 24, single, Canadian citizen. Courses in mechanical, physical and extractive metallurgy, economics and industrial economics. Technical and social activities. Summer experience on research project in metallography. Prefers production work, anywhere in Canada. Available June or July.

Stanley Chinowsky

Degree Expected: B.S. in Met. Eng.

School Address: 1018 John Jay Hall, C.U., New York 27, N. Y.

Home Address: 254 73rd St., Brooklyn 9, N. Y.

Age 22, single, draft status 2-S. Courses in physical chemistry, thermodynamics, kinetic theory and statistical mechanics, physical, mechanical and extractive metallurgy, X-ray metallography, theoretical structural metallurgy. Social activities. Interested in research, any location. Available June.

Lazarus Carl Weiner

Degree Expected: Dr. Eng. Sc. (Met.)

School Address: 88 Morningside Drive, New York 27, N.Y.

Home Address: Same.

Age 28, single, draft status 5-A. Strong metallurgical and allied science graduate study with some law. Graduate assistanships, honor societies, Who's Who in American Colleges and Universities, athletics and student government. Experience in metallurgical research, Ames Laboratory, A.E.C., including Master's research on electrical resistivity. Three years government contract research in metallurgy at Columbia. Doctorate thesis on "Environmental Effects on Fracture". Teaching experience in metallurgy. Prefers technical administrative position in East. Available September.

Georgia Institute of Technology

William Scott Dugan, Jr.

Degree Expected: B.S. in Mech. Eng.

School Address: Box 382, Georgia Tech, Atlanta, Ga.

Home Address: 1101 Altamaha St., Chattanooga, Tenn.

Age 22, single, ROTC. Social, technical activities. Usual subjects in major. Prefers research, development or operations. Experience includes heating equipment installation, machinist, sheet metal working, welding, welding research and development, maintenance and other phases in steam generating equipment manufacture. Available Jan. 1, 1957.

University of Kentucky

Ernest George Kendall

Degree Expected: Ph.D. in Eng.

School Address: 261 Elmwood Dr., Lexington, Ky.

Home Address: Same

Age 29, married, one child, veteran, draft status 5-A. B. S. and M. S. in metallurgical engineering. Major in physical metallurgy, minors in chemistry and production metallurgy. International Nickel Co. research fellow, graduate research in titanium binary systems and the "Zirconium-Platinum Alloy System". Five years experience in research, development, engineering, production in titanium metallurgy. One year teaching ferrous metallurgy. Locate anywhere. Available Fall.

Drexel Institute of Technology

Rudolph A. Becker

Degree Expected: B.S. in Met. Eng.

School Address: 74 Maple Drive, Huntingdon Valley, Pa.
Home Address: Same.

Age 23, single, will receive commission in June. Majored in metallurgical engineering. Social, technical activities. Experience in foundry work, radiography, laboratory testing, metallographic examination and corrosion. Prefers production or development work in East. Available after August.

Leonard Berenbaum

Degree Expected: B.S. in Met. Eng.

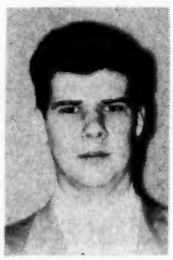
School Address: 5729 Beaumont Ave., Philadelphia 42, Pa.
Home Address: Same

Age 22, single, draft status 2-S. Courses in physical, process, mechanical and foundry metallurgy, welding, physical chemistry, seminar and thesis. Chairman student chapter A.S.M. Experience in heat treatment of steel, cold drawing stainless steel, physical testing of steel and nonferrous metals, development work in brazing and welding. Desires development work in Philadelphia area but will consider other locations. Available June 18.

Walter M. Bird

Degree Expected: B.S. in Met. Eng.

School Address: 5515 Torresdale Ave., Philadelphia 24, Pa.
Home Address: Same



Age 24, married, two children, draft status 3-A. Major courses in metallurgical engineering. Vice-chairman student chapter A.S.M. Experience in welding research, quality control, openhearth investigation and steel mill maintenance. Production or development preferred within 500-mile radius of Philadelphia. Available June 18.

John M. Cigan

Degree Expected: B.S. in Met. Eng.

School Address: 3405 Powelton Ave., Philadelphia 4, Pa.
Home Address: 440 Washington St., Leetsdale, Pa.

Age 22, single, social activities. Experience in ferrous quality control, materials testing and inspection, research and development in nonferrous process metallurgy. Prefers development or production work in process metallurgy. Available August.

Drexel (Cont.)

John Clydesdale

Degree Expected: B.S. in Met. Eng.

School Address: 835 E. Glenview St., Philadelphia 11, Pa.
Home Address: Same

Age 21, single, draft status 2-S. Courses in physical, process, mechanical and foundry metallurgy, welding, corrosion, physical chemistry, seminar and thesis. Experience includes physical testing of cold drawn stainless steel and metallographic laboratory assistant in steel mill. Prefers production or development in Philadelphia area. Available July.

David P. Laverty

Degree Expected: B.S. in Met. Eng.

School Address: 216 N. 33rd St., Philadelphia 4, Pa.
Home Address: 122 Sylvan Terrace, Harrisburg, Pa.

Age 22, single. Courses in physical, process, mechanical and foundry metallurgy, corrosion, welding, physical chemistry, seminar, thesis on "Malleable Iron". Honorary societies, Who's Who in American Colleges and Universities, social, technical activities. Experience includes testing and fabrication of copper, brass, aluminum, stainless steels, high-temperature jet engine alloys. Prefers work in development or production, any location. Available August.

Robert Rosenberg

Degree Expected: B.S. in Met. Eng.

School Address: 447 S. 63rd St., Philadelphia 43, Pa.
Home Address: Same

Age 23, married, nonveteran. Majoring in metallurgical engineering, special interest in physical metallurgy. Honorary, technical activities. Experience includes mechanical testing, metallographic work, heat treating, chemical analysis, stress analysis. Prefers work on phase transformations and microstructures, East. Available mid-June.

William White Wilson III

Degree Expected: B.S. in Met.

School Address: 2423 75th Ave., Philadelphia 38, Pa.
Home Address: Same

Age 23, single, draft status 4-F. Courses in physical, process, mechanical and foundry metallurgy, strength of materials, physical chemistry, corrosion, welding, machine design. Experience in heat treating steel, physical testing of cold drawn stainless steel and gun steel, metallography and development work in stainless steel and plain steel welding, brazing and radiography. Prefers research and development, any location. Available June.

Grove City College

Paul Oliver Halttunen

Degree Expected: B.S. in Mech. Eng.

School Address: R. D. #2, Slippery Rock, Pa.
Home Address: Same

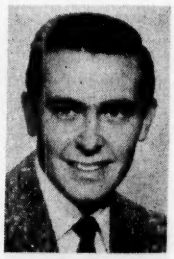
Age 21, single, no military experience, draft status 2-S, deferment until June 1956. Courses in mechanical and electrical engineering, including AC and DC machinery, mechanical drawing, mathematics, physics, chemistry, thermodynamics, heat power, refrigeration, hydraulics, mechanics, physical metallurgy, heat treatment, labor problems and economics. Technical activities. Prefers production work, Lake Erie area. Available June.

Richard B. Heasley

Degree Expected: B.S. in Met. Eng.

School Address: Box 164, G. C. C., Grove City, Pa.
Home Address: 107 Allegheny Ave., Cheswick, Pa.

Age 21, single, advanced ROTC student, to be called 120 days after graduation for technical work. Courses in general, ferrous, physical metallurgy, metallurgical calculations, metallography, heat treatment of steels, physical chemistry, strength of materials, thermodynamics, unit operations, labor problems, industrial management. Social, technical activities. Experience as laborer in steel fabrication industry. Prefers production work, western Pennsylvania, eastern Ohio. Available mid-June.



John F. Owen

Degree Expected: B.S. in Met. Eng.

School Address: 169 Lincoln Hall, G. C. C., Grove City, Pa.
Home Address: 925 Third Ave., Beaver Falls, Pa.

Age 22, single, ROTC, expects to serve 3 years. Courses in calculus, general and physical metallurgy, metallurgical calculations, ferrous metallurgy, metallography, heat treatment, physical chemistry, business administration. Technical activities. Summer work in hot mill. Prefers quality control work, any location. Available August.

William Otto Schaffnit

Degree Expected: B.S. in Met. Eng.

School Address: 351 South Hall, Box 216, G. C. C., Grove City, Pa.
Home Address: 216 Jamaica Ave., West View, Pittsburgh 29, Pa.

Age 21, single, draft status 2-S. Subjects include quantitative and physical chemistry, thermodynamics, strength of materials, differential equations, general and ferrous metallurgy, heat treatment, metallography, industrial and labor management, nuclear physics. Chairman student chapter A.S.M. Honorary fraternity. Worked as cold mill tester in large steel company. Prefers field work or production, West. Available June 15.

Grove City (Cont.)

Wayne W. Todd, Jr.

Degree Expected: B.S. in Mech. Eng.

School Address: 475 Liberty St., Grove City, Pa.
Home Address: 220 Commerce St., Beaver, Pa.

Age 21, single, 1-A draft status. Mechanical and electrical engineering subjects plus ferrous and physical metallurgy, heat treatment of steels, industrial management and labor problems. Laboratory assistant in general physics and shop last two years at college. Experience in quality control laboratory. Prefers development work, Midwest, West Coast, also consider overseas. Available Sept. 1.

Robert Glenn Uber

Degree Expected: B.S. in Mech. Eng.

School Address: P. O. Box 158, Slippery Rock, Pa.
Home Address: Same

Age 21, engaged, draft status 2-S. Subjects include chemistry, physics, mathematics, ferrous and physical metallurgy, heat treatment, strength of materials, thermodynamics, electrical and mechanical engineering subjects. Merit awards, technical activities. Clerk and service experience in plumbing, heating, appliance business. Production work preferred, likes detail and precision. No territorial preference. Available June.

Graham Ernest Wagner

Degree Expected: B.S. in Met. Eng.

School Address: Box 158, G. C. C., Grove City, Pa.
Home Address: 33 Maplewood Ave., Pittsburgh 5, Pa.

Age 21, single, draft status 1-A. Courses in general metallurgy, including chemical, physical, industrial and labor problems. Active in collegiate, fraternal, professional groups. Four summers at refractories company. Interested in all phases metallurgy, no geographical preference. Available June.

Michigan State University

Jack Todd Norton

Degree Expected: B.S. in Met. Eng.

School Address: 1809 Clifton, Lansing 10, Mich.
Home Address: Same

Age 21, single, ROTC, subject to active duty in 1956. Major studies in metallurgical engineering. Technical, social activities. Prefers development and production, any location. Available June.

Lafayette College

Ronald C. Brucker

Degree Expected: B.S. in Met. Eng.

School Address: Delta Tau Delta, Easton, Pa.
Home Address: 1381 River Rd., West Englewood, N. J.

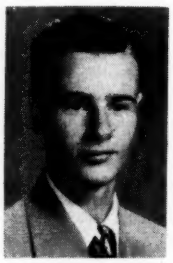
Age 21, single, draft status 2-S. Majored in metallurgy, special interest in physical metallurgy. A.S.T.M. student award. Summer experience in metallurgy laboratory. Interested in physical metallurgy in general, any location. Available July 1.

William E. Burrows

Degree Expected: B.S. in Met. Eng.

School Address: 108 Easton Hall, Easton, Pa.
Home Address: 164 Providence St., Waverly, N. Y.

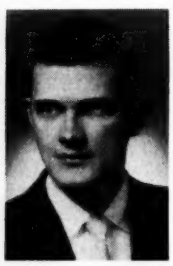
Age 21, married, draft status 1-A. Courses in physical metallurgy, including powder, foundry, ferrous and nonferrous production metallurgy. Technical activities. Summer work in research and development laboratory. Prefers production or development in nonferrous industry, or rare metal work. Prefers Northeast, but not essential. Available mid-June.



William Nelson Easton

Degree Expected: B.S. in Met. Eng.

School Address: 22 Sullivan Village, Easton, Pa.
Home Address: 1637 Williams Way, Norristown, Pa.



Age 22, married, ROTC, draft status 1-D. Courses in extractive ferrous and nonferrous metallurgy, physical metallurgy, foundry. Technical activities. Summer work in chemical laboratory openhearth plant. Physical metallurgy or development, or production control preferred, eastern part of U. S., preferably eastern Pennsylvania. Available September.

William J. Farmer

Degree Expected: B.S. in Met. Eng.

School Address: Phi Delta Theta Fraternity, Easton, Pa.
Home Address: 3rd St., Smithton, Pa.

Age 21, single, 2-S draft status. Courses in foundry, physical metallurgy, metallurgy of iron and steel, nonferrous, powder metallurgy, mineral dressing, light metals. Social, honorary, technical organizations. Summer work at steel company. Prefers ferrous production in Pittsburgh area. Available June 10.

Lafayette (Cont.)

Frederick F. Hunt

Degree Expected: B.S. in Met. Eng.

School Address: Soles Hall, Easton, Pa.
Home Address: 18 Ford Ave., Wharton, N. J.

Age 20, single, draft status 2-S. General engineering background with emphasis on metallurgy and chemistry. A.S.M. scholarship, Frazer Prize in metallurgy. Honorary, social organizations. Prefers research or production, preferably in East. Available June 8.

James Russell Hunter

Degree Expected: B.S. in Met. Eng.

School Address: Sigma Nu Fraternity, Easton, Pa.
Home Address: 236 Wainwright Ave., Pittsburgh 27, Pa.

Age 21, single, draft status 2-S. Major in metallurgy. Social, technical activities. Experience as metallurgical observer. Desires production work, western Pennsylvania or Ohio. Available June 10.

William J. Romanello

Degree Expected: B.S. in Met. Eng.

School Address: 104 Soles Hall, Easton, Pa.
Home Address: 353 W. 26th St., New York 1, N. Y.

Age 21, single, draft status 2-S. Interested in nonferrous metallurgy, namely copper and aluminum. Worked at scrap metal shop four years while at high school, two summers at smelting and refining plant. Prefers position in Eastern U. S. Available June 7.

Donald Sayenga

Degree Expected: B.S. in Met. Eng.

School Address: 406 Gates Hall, Easton, Pa.
Home Address: 506 Berwin Ave., Pittsburgh 26, Pa.

Age 21, single, ROTC commission upon graduation. Courses in chemistry and applied metallurgy. Honorary, social, technical organizations. No previous professional experience. Interested in extractive work, ferrous or nonferrous, any location. Would like to enter company training program and be able to complete before called to service. Available June.

Lafayette (Cont.)

George R. Watts, Jr.

Degree Expected: B.S. in Met. Eng.

School Address: Delta Upsilon Fraternity, Easton, Pa.
Home Address: A-21, Montgomery Court Apts., Narberth, Pa.

Age 21, single, draft status 2-S. Extractive ferrous and nonferrous metallurgy, powder and physical metallurgy, mineral dressing, ferrous and nonferrous photomicrography and heat treating courses. Technical activities. Summer work as metallurgical observer. Prefers production or management, anywhere in U. S., will consider Canada. Available July 1.

Lehigh University

Leonard S. Dorsett

Degree Expected: B.S. in Met. Eng.

School Address: 514 Delaware Ave., Bethlehem, Pa.
Home Address: RD #1, York Haven, Pa.

Age 19, single, Ordnance ROTC. Usual metallurgical subjects. Prefers production or engineering work, preferably in New England region. Available July.

Richard J. Gennone

Degree Expected: B.S. in Met. Eng.

School Address: 20 W. Laurel St., Bethlehem, Pa.
Home Address: 3011 Swede Rd., Washington Square, Norristown, Pa.

Age 28, married, veteran W.W. II and Korea, 5-A status. Especially qualified in physical metallurgy, physical chemistry, organic chemistry, electrometallurgy. Honorary, technical organizations. Experienced as research assistant in metallurgy. Prefers nonferrous industry, Northeast or Midwest, will consider good opportunity in West or South. Available August 1.

J. Albert Hamilius

Degree Expected: M.S. in Met.

School Address: Dept. of Metallurgy, Lehigh University, Bethlehem, Pa.
Home Address: Esch-sur-Alzette, 25 rue de Belvaux, Luxembourg.

Age 26, single. Diploma from Ecole Centrale des Arts et Manufactures, Paris. Speaks, writes French, German, English. Interested in production, iron and steel engineering in France, Belgium or Luxembourg. Available July.

Lehigh (Cont.)

Frederick C. Kahlbaugh

Degree Expected: B.S. in Met. Eng.

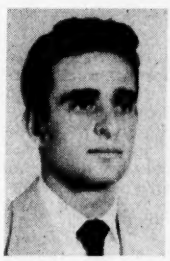
School Address: 805 Delaware Ave., Bethlehem, Pa.
Home Address: 224 Sunnyside Ave., Chester, Pa.

Age 20, single, draft status 2-S. Courses in nonferrous and physical metallurgy, iron and steel, electrometallurgy, metallurgical problems, technical writing. Social, technical activities. Prefers development or production, any location. Available July.

Lawrence Lewis

Degree Expected: M.S. in Met.

School Address: 825 Hoffert St., Bethlehem, Pa.
Home Address: 424 E. 5th St., Mt. Vernon, N. Y.



Age 22, single, draft status 2-S. Physical metallurgy curriculum. Scholarship student. Industrial experience includes metallography, testing, research. Desires research work in East. Available Summer.

Laval University

Charles E. Beaulieu

Degree Expected: B.S. in Met. Eng.

School Address: 1445 Blvd. de l'Entente, Quebec 6, P. Q., Canada
Home Address: Amqui, P. Q., Canada

Age 25, engaged. Holds B.A., graduated with honors. Courses include theoretical and practical aspects of physical and extractive metallurgy. Kennecott Copper Corp. scholarship for two years, Engineering Institute of Canada award. Sports, social activities. Summer work in copper smelter, openhearth plant, powder metallurgy, foundry control. Prefers development or production in Quebec or Ontario. Available May.

Normand Plante

Degree Expected: B.S. in Met. Eng.

School Address: 930 Madeleine de Vercheres, Quebec 6, P. Q., Canada
Home Address: 2243 Laval St., Shawinigan Falls, P. Q., Canada

Age 22, single, not subject to military service. Subjects include ferrous and nonferrous metallurgy, physical chemistry, metallography, mechanical metallurgy, ore dressing, industrial engineering. Social activities. Experience in nonferrous metallurgy, surveying, supervision. Interested in physical metallurgy and administration, any location. Contemplating post-graduate studies. Speaks French and English. Available May.

McGill University

Paul E. Biron

Degree Expected: B. Eng. (Met.)

School Address: 3500 Shuter St., Montreal, P.Q., Canada
Home Address: St. Croix, Lotbiniere Co., P.Q., Canada

Age 23, married. Physical and extractive metallurgy B.A. degrees, several scholarships. Speaks three languages, has had some practice as chemistry tutor. Summers in communications, foundry, aluminum fabrication and steel openhearth. Prefers production or development work in mine, refinery or foundry, foreign service or Canada. Available June.

James Arthur Stephenson

Degree Expected: B. Eng. (Met.)

School Address: 116 Morrison Ave., Town of Mt. Royal, P.Q., Canada.
Home Address: Same

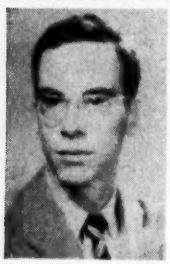
Age 21, single. Courses in mineral dressing, ferrous and nonferrous metallurgy. Fraternity, technical and social activities. Experience as research assistant, technician in smelter, material testing laboratory and senior assistant geologist for one summer. Prefers product development, administration or sales, any location. Available May.

Massachusetts Institute of Technology

Benjamin C. Allen

Degree Expected: Doctor of Science

School Address: 209 Graduate House, M.I.T., Cambridge, Mass.
Home Address: 520 Panmure Rd., Haverford, Pa.



Age 25, single, draft status 2-S. Subjects include process metallurgy and cermets. Fraternities. Worked two summers in cast iron foundry doing chemical analysis and physical tests. Prefers research or development. Available Summer.

Robert Jay Block

Degree Expected: S.B. in Phys. Met.

School Address: 155 Bay State Rd., Boston 15, Mass.
Home Address: 1259 E. 27th St., Brooklyn 10, N. Y.

Age 21, single, draft status 2-S. Courses in physical metallurgy, ferrous and nonferrous alloys, process and powder metallurgy, X-ray metallography, mineral engineering, plastic working of metals, ceramics, welding, materials testing. Thesis on "Effects of Surface Oxidation on Recrystalization". Deans list. Summer experience in electrometallurgy, metals research laboratory, high-temperature alloy studies. Research work preferred. Available July.

M. I. T. (Cont.)

Walter Samuel Cremens

Degree Expected: Doctor of Science (Phys. Met.)

School Address: 19 Fayette St., Cambridge, Mass.
Home Address: Same

Age 29, married, veteran. Three and one half years experience, principally with high-temperature materials for jet engines. Undergraduate scholarship, graduate award and assistantship. Technical societies. Studies in physical metallurgy, X-rays and crystal physics, thermodynamics, physics of strength and plasticity, electron microscopy, powder metallurgy, metals at elevated temperatures, experimental stress analysis. Minor in mechanical engineering. Thesis on "High-Temperature Properties of Nickel Containing Fine Dispersions of Aluminum Oxide". Available Summer.

Jacob David Gubbay

Degree Expected: S.B. in Met.

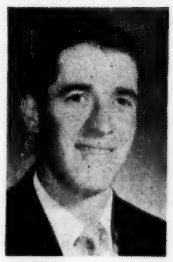
School Address: East Campus, M.I.T. Dorms, Cambridge 39, Mass.
Home Address: Bombay, India

Age 21, single. Major in powder metallurgy but also interested in foundry. Sassoon Trust Scholarship (Bombay) and Anglo-Indian Scholarship. (Bombay). Technical, sports activities. Research laboratory experience in foundry project at M.I.T. and research center. Prefers research in powder metallurgy or foundry, any location. Available September.

Philip S. Schaffer

Degree Expected: S.B. in Met.

School Address: 155 Bay State Rd., Boston, Mass.
Home Address: 42 Winston Rd., Dorchester 24, Mass.



Age 21, single, draft status 2-S. Regular courses in metallurgy. Particular interest in foundry. Experience in experimental foundry for two years including summers and part-time during school year. Social, technical activities. Prefers work in foundry operations, any location. Available June.

Edward T. Stephenson

Degree Expected: S.M. in Met.

School Address: 17 Cummings Rd., Brookline 46, Mass.
Home Address: 30 Collins Ave., Pleasantville, N. J.

Age 26, married, draft status 1-C, reserve. Graduate courses include advanced physical metallurgy, thermodynamics, physics of metals, X-ray metallurgy, plastic working of metals, experimental methods in metallurgy, high-temperature metallurgy, advanced calculus. Technical and honorary societies. Prefers development or applied research, New Jersey or Pennsylvania. Available July.

Michigan College of Mining & Technology

Paul D. Deeley

Degree Expected: B.S. in Met. Eng.

School Address: 511 Hancock St., Hancock, Mich.
Home Address: 20739 Young Lane, Grosse Pointe Woods 36, Mich.

Age 26, married, two children, draft status 5-A, veteran. Regular metallurgical engineering courses. Officer student chapter A.S.M. Four years sales and production experience, three years research in Air Force. Desires sales or production, any location. Available June 15.

John D. Gruner

Degree Expected: B.S. in Met. Eng.

School Address: 1007 Jasper St., Houghton, Mich.
Home Address: Rt. #6, Coldwater, Mich.

Age 22, single, ROTC. Technical, social activities. Experience in construction work and on Great Lakes freighters. No work preference, Western U. S. Available June.

Auvo Iivar Kemppinen

Degree Expected: M.S. in Met. Eng.

School Address: 420 Lovell Rd., Houghton, Mich.
Home Address: Kuusitie 14, Helsinki-Toolo, Finland

Age 25, married, one child, has first citizenship papers, draft status 2-S. Social, honorary, technical organizations. Who's Who in American Colleges and Universities. Summer work in foundry, galvanizing, airplane forgings. Prefers applied research or heat treatment, preferably in Western U.S. Available September.

Edward J. Koepel

Degree Expected: B.S. in Met. Eng.

School Address: Lock Box 438, Hubbell, Mich.
Home Address: Same

Age 21, draft status 2-S, single. Major courses in physical metallurgy. Experience in quality control laboratory of mining company and in commercial photography. Prefers work in foundry or related industry, North Central U. S. Available June 11.

Michigan Tech (Cont.)

John Douglas Latva

Degree Expected: B.S. in Met. Eng.

School Address: 1201 E. 5th St., Houghton, Mich.
Home Address: 1900 Linden, Dearborn, Mich.

Age 21, single, ROTC. Courses in powder metallurgy, alloy steels, foundry, applied heat treatment, pyrometry, physical and process metallurgy, electrometallurgy. Honorary and professional fraternities. Experience in powder metallurgy field. Prefers work in powder metallurgy. Available July.

University of Minnesota

Norman Bernstein

Degree Expected: B. Met. Eng.

School Address: 526 11th Ave. S.E., Minneapolis, Minn.
Home Address: 79 Ridgeview, Sioux City, Iowa

Age 22, single, draft status 2-S. Courses in process and physical metallurgy. Technical, social activities. Worked summers in scrap metal yard with ferrous and nonferrous metals, and as assistant chemist at University. Prefers nonferrous process metallurgy in larger city. Available July.

Thomas Burnstad

Degree Expected: B.S. in Met. Eng.

School Address: 2063 B Hoyt Ave., W., St. Paul 8, Minn.
Home Address: Same

Age 26, married, two children, veteran. Major studies in process and physical metallurgy. Prefers sales, technical representative work, production or laboratory teaching assistant, any location. Available June.

Spiro B. Paskal

Degree Expected: B. Met. Eng.

School Address: 217 Walnut St., Minneapolis 14, Minn.
Home Address: Same

Age 30, married, veteran. No engineering experience. Holds B. Bus. Adm., 1949, has three years experience in foreign banking and export and import. Languages. Desires position in or near city, not adverse to traveling or to some administrative duties. Available July.

New York University

John F. Breedis

Degree Expected: B. Met. Eng.

School Address: 530 W. 163rd St., New York 32, N. Y.
Home Address: Same

Age 21, single, draft status 2-S. Courses in calculus, quantitative analysis, physical chemistry, strength of materials, physical and mechanical metallurgy, physics of metals, metal technology. Honorary, technical organizations. Research laboratory experience. Senior thesis on "Internal Friction". Prefers research or development work, any location. Available June.

John N. Carris

Degree Expected: B. Met. Eng.

School Address: 611 W. 135th St., New York 31, N. Y.
Home Address: Same

Age 21, single, draft status 2-S. Subjects include mechanical engineering, metal technology, engineering materials, metallurgical engineering. Electives in industrial management, engineering economics, statistical methods. Prefers inspection (quality control), production or position leading to management, New York area. Available June 20.

Richard A. Georgetti

Degree Expected: B. Met. Eng.

School Address: 2291 Loring Place, Bronx 68, N. Y.
Home Address: 127 Minerva Drive, Yonkers, N. Y.

Age 21, single, draft status 1-D, ROTC. Courses in physical and mechanical metallurgy, production of metals, metals technology, physics of metals. Technical organizations. Prefers work in development or production, New York area, will travel if necessary. Available June 15.

Henry J. Miller

Degree Expected: B.S. in Met. Eng.

School Address: Psi Upsilon House, 115 W. 183rd St., New York 53, N. Y.
Home Address: 6206 Tyndall Ave., New York 71, N. Y.

Age 21, single, ROTC. Courses in physics, differential and integral calculus, qualitative and quantitative chemistry, physical chemistry, production of metals, physical and mechanical metallurgy, metals technology, engineering law, economics, statistics and quality control. Thesis on "Linear Analysis of Twinning Vs. Composition". Technical, social activities. Prefers development or production leading to management, any location. Available June 1.

New York (Cont.)

Nino Pompilio

Degree Expected: B. Met. Eng.

School Address: 8947 133rd St., Richmond Hill 18, Queens, N. Y.
Home Address: Same

Age 22, single, veteran. Courses in calculus, differential equations, physics, qualitative and quantitative analysis, physical chemistry, thermodynamics, production of metals, engineering materials, metallurgical engineering, mechanical and physical metallurgy, metal technology, physics of metals. Thesis on "Single Crystal Growth and X-Ray Diffraction". Electives in industrial management. Technical societies. Prefers development or production work, any location. Available June.

Missouri School of Mines and Metallurgy

Harry Dwayne Hays

Degree Expected: B.S. in Met. Eng.

School Address: Apt. I-1, Jackling Terr., Rolla, Mo.
Home Address: New London, Mo.

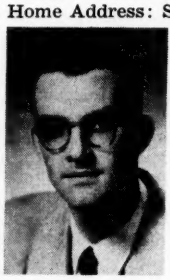
Age 21, married, 3-A draft status. Interested in physical, extractive and foundry metallurgy. Foundry Educational Foundation scholarship four consecutive semesters. Technical societies. Experience in ore dressing and physical metallurgy. Uncertain as to field of work preferred, but prefers Midwest, if possible. Available May.

Ohio State University

Norbert D. Greene, Jr.

Degree Expected: Ph.D. in Met. Eng.

School Address: 1807 North Star Rd., Columbus 12, Ohio
Home Address: Same

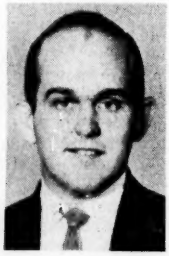


Age 24, married, draft status 2-S. Undergraduate degree in chemical engineering. Courses in electro, inorganic, organic, physical and analytical chemistry, physical metallurgy, corrosion, theory of solid state, thermodynamics. Honorary, technical organizations. Research fellowship. Summer work and graduate research in metallic corrosion. Prefers research in corrosion or surface chemistry, any location in U. S. Available September.

Daniel A. Wilson

Degree Expected: B. of Welding Eng.

School Address: 154 E. 11th St. Ave., Columbus 1, Ohio
Home Address: Same



Age 22, married, ROTC, subject to two years active duty as research and development engineer. Honorary, technical, social activities. Experience in general maintenance, drafting, malleable iron foundry inspection, research on weldability of materials. Prefers development work, Southwest or West. Available June.

Notre Dame University

D. Charles Antrobus, Jr.

Degree Expected: B.S. in Met. Eng.

School Address: 242 Alumni Hall, Notre Dame, Ind.
Home Address: 705 N. Willett St., Memphis 7, Tenn.

Age 21, single, draft status 2-S. A.S.M. and Sears Roebuck scholarships. Technical activities. Courses in physical and extractive metallurgy. Prefers diversified work in metallurgy or related fields, Southern U. S. Summer work in sheet metal shop, survey party, large chemical company. Available July.

Samuel Vincent Glorioso

Degree Expected: B.S. in Met.

School Address: 203 Fisher Hall, Notre Dame, Ind.
Home Address: 2337 Vance Ave., Alexandria, La.

Age 21, single, draft status 2-S. Courses in physical and extractive metallurgy. A.S.M. scholarship. Technical organizations. Prefers physical metallurgy, South or Southwest. Available July.

Thomas K. McCluhan

Degree Expected: B.S. in Met.

School Address: 1015 Cleveland Ave., South Bend, Ind.
Home Address: Winnebago, Neb.

Age 22, single, must serve three years in Air Force. Major studies in physical metallurgy. Prefers research in physical metallurgy, likes field of aeronautics. No territorial preference. Available August 1959.

Leo J. Sandmann, Jr.

Degree Expected: B.S. in Met. Eng.

School Address: 226 N. St. Peter St., South Bend 17, Ind.
Home Address: 1878 Douglass Blvd., Louisville 5, Ky.

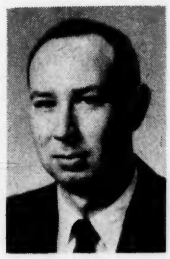
Age 22, single, draft status 4-F (height). Major studies in physical metallurgy. Summer work in metallurgical laboratory. Prefers work with light metals, titanium or semiconductors. No territory preference. Available February.

Pennsylvania State University

Robert A. Arnold, Jr.

Degree Expected: B.S. in Met.

School Address: 123 W. Nittany Ave., State College, Pa.
Home Address: Box 11, Cornwall, Pa.



Age 24, single, draft status 1-C, reserve. Technical activities. Usual metallurgical courses. Desires extractive or foundry metallurgy, East or Midwest. Available June.

Ralph G. Dermott

Degree Expected: B.S. in Met.

School Address: General Delivery, Centre Hall, Pa.
Home Address: 1220 W. Rush St., Philadelphia 33, Pa.

Age 27, married, one child, veteran, Naval Reserve aviator. Courses in extractive and production metallurgy, metallography, advanced physical and chemical metallurgy, physical chemistry, mechanics and Russian. Officer student chapter A.S.M.. Two years part-time work on electroplating project. Prefers research and development work, any location. Available July.

Donald Grant Fleck

Degree Expected: B.S. in Met.

School Address: Alpha Chi Sigma, State College, Pa.
Home Address: Star Lake, N. Y.

Age 22, single, eligible for draft. Fraternities, technical organizations. Usual metallurgical courses. Worked four summers for big steel companies. Available July.

Hall L. Harman

Degree Expected: B.S. in Met.

School Address: R.D. #1, Box 301, Bellefonte, Pa.
Home Address: Same

Age 21, single, draft status 2-S. Several scholarships and awards. Social, technical and honorary organizations. Two summers in metallurgical problems in steel mills. High scholastic standing. Interested in employment anywhere in U. S. Available June 25.

Penn State (Cont.)

Robert C. McCormick

Degree Expected: B.S. in Met.

School Address: Alpha Chi Sigma, State College, Pa.
Home Address: 112 Price Ave., Belle Vernon, Pa.

Age 21, single, draft status 2-S. Courses in chemical and physical metallurgy, ferrous and nonferrous production and metallography, metallurgical engineering. Experience in both large and small steel companies, part-time work in departmental research at University. Desires sales, production or development, East or Midwest. Available after June 15.

Asutosh Pal

Degree Expected: M.S. in Met.

School Address: Dept. of Metallurgy, P.S.U., University Park, Pa.
Home Address: 3/1 Priyanath Mullick Rd., Calentha 25, India

Age 31, married. Major courses in metallurgy. Holds two Indian degrees. Nine years industrial experience in charge of foundry, melting, sand testing, shell molding, heat treatment, mechanical testing, chemical laboratory. Five years research experience in India, seven papers published. Prefers industrial work in India. Available August.

Thomas D. Pasternack

Degree Expected: B.S. in Met.

School Address: 221 Seventh Ave., Burnham, Pa.
Home Address: Same

Age 24, single, veteran, draft status 1-C, reserves. No professional experience. Usual metallurgical subjects. Prefers customer contact, any location. Available July 10.

George A. Reimann

Degree Expected: B.S. in Met.

School Address: Box 114, Baalsburg, Pa.
Home Address: 125 Old Gulph Rd., Wynnewood, Pa.

Age 23, single, ROTC, commission in June. No significant industrial experience. Usual metallurgical subjects. Prefers development or production, Northeastern U. S. Available June 12.

Penn State (Cont.)

Donald L. Ryan

Degree Expected: B.S. in Met.

School Address: 230 S. Frazier St., State College, Pa.
Home Address: 416 Broad St., Derry, Pa.

Age 21, single, ROTC. Subjects include ferrous and nonferrous metallurgy. Social activities. Experience as laboratory assistant in steel plant. Desires production metallurgy, Northeastern U. S. Available June 10.

Laurence C. Shaheen

Degree Expected: B.S. in Met.

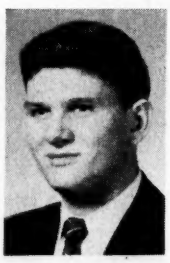
School Address: Phi Kappa Tau, State College, Pa.
Home Address: 2109 Eighteenth St., Altoona, Pa.

Age 22, single, draft status 2-S. Major studies in metallurgy and chemistry. Social, honorary, technical activities. Experience as research assistant and in laboratory work. Prefers quality control, sales, production (finished products), any location. Available June 11.

Frederick A. Sotok

Degree Expected: B.S. in Met.

School Address: 230 S. Frazier St., State College, Pa.
Home Address: P.O. Box 43, Morrisdale, Pa.



Age 21, single, ROTC. Courses in metallurgy, both ferrous and nonferrous. Technical organizations. Prefers production metallurgy in Northeastern U. S. Available June 11.

University of Pittsburgh

Clifford C. Ellery

Degree Expected: B.S. in Met. Eng.

School Address: 519 S. Trenton Ave., Pittsburgh 21, Pa.
Home Address: Same

Age 23, single, draft status 1-D. Courses in process, mechanical and physical metallurgy, ferrous and nonferrous metallurgy and metallography, electrometallurgy, thermodynamics. Social, technical and sports activities. Experience includes four years with metallurgical department steel company, nine months with acid steel production, one summer research laboratory. Interested in production leading to management, any location. Available June.

Purdue University

Lawrence W. Lindquist

Degree Expected: B.S. in Met. Eng.

School Address: Box 573, Cary Hall NE, West Lafayette, Ind.

Home Address: 208 Bullard Court, Menasha, Wis.

Age 22, single, not eligible for military service. Experience in paper company for 1½ years, plus other summer work. Prefers work in nonferrous field, especially aluminum. Interested in foreign employment, with emphasis on South America. Available June 5.

Harvey Bernard Meieran

Degree Expected: B.S. in Met. Eng.

School Address: 102 Waldron St., West Lafayette, Ind.

Home Address: 3941 Bushnell Rd., University Heights 18, Ohio

Age 21, single, ROTC. Major studies in metallurgical engineering. Honor, social, technical activities. Development laboratory assistant experience. Prefers research and development, nonferrous.

Donald J. Tarney

Degree Expected: B.S. in Met. Eng.

School Address: Box 926, Cary Hall, West Lafayette, Ind.

Home Address: 106 Mason St., Calumet City, Ill.

Age 21, single, ROTC. Courses in ferrous metallurgy, interested in foundry. Technical activities. Practical experience includes several summers in metallurgical laboratory of large jobbing foundry. Prefers production shop or practical research laboratory work in Midwest. Available September.

C. Bradley Ward

Degree Expected: B.S. in Met. Eng.

School Address: 308 North St., Box 495, West Lafayette, Ind.

Home Address: 1700 N. Eighth St., Pekin, Ill.

Age 21, will marry in June, ROTC. Social, honorary, technical activities. Experience in metallurgical laboratory, heat treat engineering, nonferrous foundry. Interested in general metallurgical work, production design, research, in Michigan, Minnesota or Wisconsin. Available June.

Polytechnic Institute of Brooklyn

Robert Henry Bilangi

Degree Expected: B. Met. Eng.

School Address: 2216 63rd St., Brooklyn 4, N. Y.

Home Address: Same

Age 20, single, draft status 2-S. Courses in physical metallurgy of ferrous and nonferrous metals and their alloys. Thesis on "Stress Corrosion". Technical organizations. Desires development work, any location. Available July.

John J. Palenchar

Degree Expected: B. Met. Eng.

School Address: 36 Sidney Place, Brooklyn 1, N. Y.

Home Address: 541 Midland St., Bridgeport, Conn.

Age 29, single, veteran. Courses in ferrous and nonferrous metallurgy, plastic forming of metals, industrial economics and management, welding and design, thermodynamics, physical metallurgy. Social activities. Metallurgical laboratory work for four years. Prefers production and sales leading to management, any location. Available June 25.

Olev Paul

Degree Expected: B. Met. Eng.

School Address: 329 50th St., Brooklyn 20, N. Y.

Home Address: Same

Age 28, single, draft status 5-A, veteran. Dean's list, A.S.M. scholarship. Experience in research in large company, and as assistant instructor on part-time basis. Prefers research, development or production, in vicinity of university offering courses leading to advanced degrees. Available June.

Queen's University

Donald W. R. George

Degree Expected: M. Sc.

School Address: 438 Frontenac St., Kingston, Ont., Canada

Home Address: 248 Niagara St., St. Catherines, Ont., Canada

Age 23, single, B.Sc. degree from Queen's in 1955, with honors, winning the Steel Co. of Canada fellowship. Five months experience with development and special duties division of steel company. Prefers metallurgical development, Ontario. Available June or July.

Rensselaer Polytechnic Institute

Jack L. Bohan

Degree Expected: B. Met. Eng.

School Address: 10-2 Edgehill Terrace, Troy, N. Y.
Home Address: Same

Age 24, married, two children, draft status 1-C, served in Navy doing electronic repair. Courses in physical metallurgy, thermodynamics, electrometallurgy, welding, nonferrous alloys, production, statistical analysis, personnel management. Social, technical activities. Experience in steel mill quality control, organizing and operating chemical and physical analysis in iron foundry. Prefers work in production, West or Midwest. Available July.

Gary C. Irons

Degree Expected: B. Met. Eng.

School Address: 243 Hoosick St., Troy, N. Y.
Home Address: R.D. #3, Cooperstown, N. Y.

Age 21, single, draft status 2-S. Social, technical activities. Worked summers as surveyor. No preference as to type of work or location. Available June.

Kenneth Richard Jordan

Degree Expected: B. Met. Eng.

School Address: 57 Second St., Troy, N. Y.
Home Address: 119 Jackson Ave., North Plainfield, N. J.

Age 21, single, draft status 2-S. Honorary, technical, social activities. American Brake Shoe scholarship. Worked four weeks in experimental foundry, two summers as technical assistant. Prefers production or development, Northeastern U. S. Available June 18.

John Kroehler

Degree Expected: B. Met. Eng.

School Address: 31 Belle Ave., Troy, N. Y.
Home Address: 62 Central Ave., Baldwin, N. Y.

Age 21, single, ROTC, subject to active duty. Subjects include metallography, physical metallurgy, metallurgical thermodynamics and nonferrous alloys. Dean's list. Technical activities. Interested in light metals production, any location. Available June.

Rensselaer (Cont.)

Rivka DeCamp

Degree Expected: M. Met. Eng.

School Address: 44 Institute Ave., Troy, N. Y.
Mail Address: R.P.I., Troy, N. Y.

Age 27, married. Courses in behavior of metals, fracturing of metals, high-temperature alloys, physical metallurgy, experimental stress analysis, ferrous production metallurgy. Thesis on "Copper to Ceramic Seal". Holds production supervision certificate from Pratt Institute of Technology. Experience as junior toolmaker and research assistant. Prefers production and/or development of turbine and/or reactor materials and their processing. Denver preferred, other locations considered. Available February.

Ronald Alfred Neaton

Degree Expected: B. Met. Eng.

School Address: 703 Eighth St., Watervliet, N. Y.
Home Address: Same

Age 21, single, ROTC, subject to immediate active duty. Courses in physical, production, ferrous and nonferrous metallurgy, thermodynamics, metallography, electrometallurgy, X-ray metallography, analytical and physical chemistry. Technical, social activities. Summer work in steel plant. Available Summer 1958.

Burton S. Payne Jr.

Degree Expected: B. Met. Eng.

School Address: 1932 Fifth Ave., Troy, N. Y.
Home Address: 397 Jersey Rd., Williamson, N. Y.

Age 21, married, draft status 1-A. Courses in metallurgical engineering. Several scholarships. Worked one summer at railway signal company, one summer at Eastman Kodak Co. Prefers production work. Available June.

South Dakota School of Mines and Metallurgy

James F. Buck

Degree Expected: B.S. in Met. Eng.

School Address: 130 Kansas City St., Rapid City, S. D.
Home Address: 908 Iowa Ave., S.E., Huron, S. D.

Age 22, single, draft status 2-S. Courses in metallography, fabrication and spectroscopy. Technical activities. Desires responsible position in technical sales, development or production, East or Midwest. Available March.

Ryerson Institute of Technology

Mike J. Babulic Jr.

Degree Expected: Met. Eng. Technician

School Address: 83 First Ave., Toronto, Ont., Canada
Home Address: 273 Long Lake Rd., Lockerby, Ont., Canada

Age 22, single, no draft status. Work in Ontario preferred. Available about May 15.

John M. Tudhope

Degree Expected: Diploma in Met. Tech.

School Address: 212 Indian Grove, Toronto, Ont., Canada
Home Address: 242 Harvey St., Orillia, Ont., Canada

Age 22, single. Standard metallurgical subjects, industrial organization, analytical chemistry. Thesis on "Precipitation Hardening in Magnesium". Worked one summer in steel mill metallurgical laboratory. Desires sales, research or industrial work. Willing to travel anywhere. Available mid-May.

Stanford University

Arthur N. Lord

Degree Expected: Ph.D. in Phys. Met.

School Address: 402 Crothers Memorial, Stanford, Calif.
Home Address: 7136 Stafford Ave., Huntington Park, Calif.

Age 23, single, draft status 2-S. Two summers at gear manufacturing company, one summer at steel plant, 1½ years as research assistant in metallurgy. Fraternity. Interested in applied research and development, not limited to any specialty at present. No location preference. Expect to be available between June and September.

Darrell Eugene Munson

Degree Expected: M.S. in Met.

School Address: Room 545, Crothers Memorial, Stanford, Calif.
Home Address: 113 N. Sixth St., Rapid City, S. D.

Age 22, single, draft status 2-S. Major subjects in metallurgical engineering. Professional, honorary activities. Summer work for steel companies. Prefers work in physical metallurgy, West or Midwest. Available June.

University of Tennessee

Billy Marshall Hargis

Degree Expected: B.S. in Chem. Eng.

School Address: 1526 Laurel Ave., Knoxville, Tenn.
Home Address: Box 383, Cleveland, Tenn.

Age 21, married, draft status 2-S. Metallurgy option of chemical engineering curriculum. Courses in physical, production metallurgy, physical chemistry, thermodynamics, heat transfer, fluid flow. A.S.M. scholarship. Summer work in metal parts production and assembling plant and in metallurgical research laboratory. Desires producton or development work, Southeast. Available August.

Tennessee A & I University

Charles E. Archie

Degree Expected: B.S. in Mech. Eng.

School Address: 110 East Dormitory, T.S.U., Nashville, Tenn.
Home Address: 1009 N. York St., Gastonia, N. C.

Age 21, single, draft status 1-D. Major in mechanical engineering with option in foundry and metallurgy. Courses include physical metallurgy, foundry theory and practice, application metallurgy, corrosion resistant alloys. Honorary, technical societies. Interested in research and development. No location preference. Available June 4.

Arthur M. Terry

Degree Expected: B.S. in Mech. Eng.

School Address: East Dormitory, T.S.U., Nashville, Tenn.
Home Address: East Rhea Ave., P.O. Box 161, Spring City, Tenn.

Age 21, single, draft status 2-S. Major in mechanical engineering, option in foundry engineering and metallurgy. Courses in physical metallurgy, foundry theory, foundry practice, application metallurgy, corrosion resistant alloys. Honorary, technical societies. Desires research or development, no location preference. Available June.

University of Utah

Thomas M. Kaneko

Degree Expected: Ph.D. in Met.

School Address: 202 "I" St., Salt Lake City 3, Utah
Home Address: Same

Age 41, single, B. S.. in chemical engineering. Graduate study in surface chemistry, rate processes, theory of solids, extractive metallurgy, statistical mechanics, X-ray diffraction, research in hydrogen reduction of aqueous metal salt solutions. Minored in physics. Three technical papers published. Experience as assayer, research chemist. Presently on A.E.C. surface chemistry project. Desires research and development, any location. Available June.

Rensselaer Polytechnic Institute

Jack L. Bohan

Degree Expected: B. Met. Eng.

School Address: 10-2 Edgehill Terrace, Troy, N. Y.
Home Address: Same

Age 24, married, two children, draft status 1-C, served in Navy doing electronic repair. Courses in physical metallurgy, thermodynamics, electrometallurgy, welding, nonferrous alloys, production, statistical analysis, personnel management. Social, technical activities. Experience in steel mill quality control, organizing and operating chemical and physical analysis in iron foundry. Prefers work in production, West or Midwest. Available July.

Gary C. Irons

Degree Expected: B. Met. Eng.

School Address: 243 Hoosick St., Troy, N. Y.
Home Address: R.D. #3, Cooperstown, N. Y.

Age 21, single, draft status 2-S. Social, technical activities. Worked summers as surveyor. No preference as to type of work or location. Available June.

Kenneth Richard Jordan

Degree Expected: B. Met. Eng.

School Address: 57 Second St., Troy, N. Y.
Home Address: 119 Jackson Ave., North Plainfield, N. J.

Age 21, single, draft status 2-S. Honorary, technical, social activities. American Brake Shoe scholarship. Worked four weeks in experimental foundry, two summers as technical assistant. Prefers production or development, Northeastern U. S. Available June 18.

John Kroehler

Degree Expected: B. Met. Eng.

School Address: 31 Belle Ave., Troy, N. Y.
Home Address: 62 Central Ave., Baldwin, N. Y.

Age 21, single, ROTC, subject to active duty. Subjects include metallography, physical metallurgy, metallurgical thermodynamics and nonferrous alloys. Dean's list. Technical activities. Interested in light metals production, any location. Available June.

Rensselaer (Cont.)

Rivka DeCamp

Degree Expected: M. Met. Eng.

School Address: 44 Institute Ave., Troy, N. Y.
Mail Address: R.P.I., Troy, N. Y.

Age 27, married. Courses in behavior of metals, fracturing of metals, high-temperature alloys, physical metallurgy, experimental stress analysis, ferrous production metallurgy. Thesis on "Copper to Ceramic Seal". Holds production supervision certificate from Pratt Institute of Technology. Experience as junior toolmaker and research assistant. Prefers production and/or development of turbine and/or reactor materials and their processing. Denver preferred, other locations considered. Available February.

Ronald Alfred Neaton

Degree Expected: B. Met. Eng.

School Address: 703 Eighth St., Watervliet, N. Y.
Home Address: Same

Age 21, single, ROTC, subject to immediate active duty. Courses in physical, production, ferrous and nonferrous metallurgy, thermodynamics, metallography, electrometallurgy, X-ray metallography, analytical and physical chemistry. Technical, social activities. Summer work in steel plant. Available Summer 1958.

Burton S. Payne Jr.

Degree Expected: B. Met. Eng.

School Address: 1932 Fifth Ave., Troy, N. Y.
Home Address: 397 Jersey Rd., Williamson, N. Y.

Age 21, married, draft status 1-A. Courses in metallurgical engineering. Several scholarships. Worked one summer at railway signal company, one summer at Eastman Kodak Co. Prefers production work. Available June.

South Dakota School of Mines and Metallurgy

James F. Buck

Degree Expected: B.S. in Met. Eng.

School Address: 130 Kansas City St., Rapid City, S. D.
Home Address: 908 Iowa Ave., S.E., Huron, S. D.

Age 22, single, draft status 2-S. Courses in metallography, fabrication and spectroscopy. Technical activities. Desires responsible position in technical sales, development or production, East or Midwest. Available March.

Ryerson Institute of Technology

Mike J. Babulic Jr.

Degree Expected: Met. Eng. Technician

School Address: 83 First Ave., Toronto, Ont., Canada
Home Address: 273 Long Lake Rd., Lockerby, Ont., Canada

Age 22, single, no draft status. Work in Ontario preferred. Available about May 15.

John M. Tudhope

Degree Expected: Diploma in Met. Tech.

School Address: 212 Indian Grove, Toronto, Ont., Canada
Home Address: 242 Harvey St., Orillia, Ont., Canada

Age 22, single. Standard metallurgical subjects, industrial organization, analytical chemistry. Thesis on "Precipitation Hardening in Magnesium". Worked one summer in steel mill metallurgical laboratory. Desires sales, research or industrial work. Willing to travel anywhere. Available mid-May.

Stanford University

Arthur N. Lord

Degree Expected: Ph.D. in Phys. Met.

School Address: 402 Crothers Memorial, Stanford, Calif.
Home Address: 7136 Stafford Ave., Huntington Park, Calif.

Age 23, single, draft status 2-S. Two summers at gear manufacturing company, one summer at steel plant, 1½ years as research assistant in metallurgy. Fraternity. Interested in applied research and development, not limited to any specialty at present. No location preference. Expect to be available between June and September.

Darrell Eugene Munson

Degree Expected: M.S. in Met.

School Address: Room 545, Crothers Memorial, Stanford, Calif.
Home Address: 113 N. Sixth St., Rapid City, S. D.

Age 22, single, draft status 2-S. Major subjects in metallurgical engineering. Professional, honorary activities. Summer work for steel companies. Prefers work in physical metallurgy, West or Midwest. Available June.

University of Tennessee

Billy Marshall Hargis

Degree Expected: B.S. in Chem. Eng.

School Address: 1526 Laurel Ave., Knoxville, Tenn.
Home Address: Box 383, Cleveland, Tenn.

Age 21, married, draft status 2-S. Metallurgy option of chemical engineering curriculum. Courses in physical, production metallurgy, physical chemistry, thermodynamics, heat transfer, fluid flow. A.S.M. scholarship. Summer work in metal parts production and assembling plant and in metallurgical research laboratory. Desires producton or development work, Southeast. Available August.

Tennessee A & I University

Charles E. Archie

Degree Expected: B.S. in Mech. Eng.

School Address: 110 East Dormitory, T.S.U., Nashville, Tenn.
Home Address: 1009 N. York St., Gastonia, N. C.

Age 21, single, draft status 1-D. Major in mechanical engineering with option in foundry and metallurgy. Courses include physical metallurgy, foundry theory and practice, application metallurgy, corrosion resistant alloys. Honorary, technical societies. Interested in research and development. No location preference. Available June 4.

Arthur M. Terry

Degree Expected: B.S. in Mech. Eng.

School Address: East Dormitory, T.S.U., Nashville, Tenn.
Home Address: East Rhea Ave., P.O. Box 161, Spring City, Tenn.

Age 21, single, draft status 2-S. Major in mechanical engineering, option in foundry engineering and metallurgy. Courses in physical metallurgy, foundry theory, foundry practice, application metallurgy, corrosion resistant alloys. Honorary, technical societies. Desires research or development, no location preference. Available June.

University of Utah

Thomas M. Kaneko

Degree Expected: Ph.D. in Met.

School Address: 202 "I" St., Salt Lake City 3, Utah
Home Address: Same

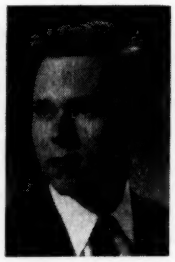
Age 41, single, B. S.. in chemical engineering. Graduate study in surface chemistry, rate processes, theory of solids, extractive metallurgy, statistical mechanics, X-ray diffraction, research in hydrogen reduction of aqueous metal salt solutions. Minored in physics. Three technical papers published. Experience as assayer, research chemist. Presently on A.E.C. surface chemistry project. Desires research and development, any location. Available June.

University of Washington

Donald C. Larson

Degree Expected: B.S. in Met. Eng.

School Address: 2719 E. 96th St., Seattle 15, Wash.
Home Address: Same



Age 21, single, 2-S draft status. Interested primarily in physical metallurgy. Has worked as laboratory assistant in physical metallurgy laboratory. Officer in student chapter A.S.M., technical, social activities. Would like to continue with studies, part-time, while employed. Available June.

Washington State College

Alf K. Eikum

Degree Expected: B. S. in Phys. Met.

School Address: Box 896 C.S., Pullman, Wash.
Home Address: Box 83, Poulsbo, Wash.

Age 22, married, one child, draft status 2-S. Courses in calculus, physics, physical chemistry, optical and X-ray metallography, ferrous and nonferrous alloys, corrosion, process metallurgy, phase equilibria, structural physical metallurgy, kinetics. Technical, social activities. Part-time work in physical metallurgical laboratory. Prefers research, development, any location. Available June.

Youngstown University

Gilbert L. Marsh

Degree Expected: B.S. in Met. Eng.

School Address: 217 Lafayette Ave., Niles, Ohio
Home Address: Same

Age 23, married, draft status 2-S. Courses in physical metallurgy, metallurgical processes. Officer in student chapter A.S.M. Honorary, technical, social activities. Experience as metallurgical laboratory technician. Prefers process engineering or research and development, Northeastern Ohio or Western Pennsylvania. Available June 4.

William K. Kramer

Degree Expected: B.S. in Phys. Met.

School Address: 510 Campus Ave., Pullman, Wash.
Home Address: 1329 4th St., Clarkston, Wash.

Age 22, single, draft status 2-S. Major fields of study include ferrous and nonferrous alloys, X-ray diffraction, metallography. Social, technical activities. Summer work as assistant in X-ray diffraction laboratory. Prefers applied research and development. Available June 15.

Richard H. Rein

Degree Expected: B. Met Eng.

School Address: 814 Brentwood Ave., Youngstown, Ohio
Home Address: Same

Age 21, single, ROTC, to enter service February 1957 for six months. Major in metallurgy with minor in mathematics and chemistry. Officer student chapter A.S.M., honorary, technical, social activities. Employed part-time in metallurgical control laboratory. Prefers management training, metallurgical work or sales in Youngstown-Cleveland-Pittsburgh district. Available June 15.

William Joseph Link

Degree Expected: B.S. in Phys. Met.

School Address: 606 Morton, Apt. 2, Pullman, Wash.
Home Address: Box 223, Mead, Wash.

Age 22, to be married in June, advanced ROTC, to be called June 1957 for six months. Courses in physical metallurgy curriculum. Honorary, social, technical activities. Work as draftsman and in research for three summers. Prefers development and research, any location. Available June 20.

The preceding 16 pages of this special issue of Metals Review carry the A.S.M. Student Member Placement Service, an annual feature. In these pages appear photographs and qualifications of nearly 130 graduating metallurgists who will be available to industry between now and next summer.

This list of available young engineers is issued as a service to the metals industry by the American Society for Metals—the engineering society of the Metals Industry.

Ben A. Wilcox

Degree Expected: B.S. in Phys. Met.

School Address: Apt. 8-E., S. Fairway, Pullman, Wasl
Home Address: 318 W. 4th St., Anaconda, Mont.

Age 21, married, ROTC. Courses in physical chemistry, metallography, ferrous and nonferrous alloys, X-ray radiography and diffraction, crystallography, corrosion, advanced and industrial physical metallurgy, seminar. Thesis on "Nitriding Titanium With Ammonia". Social, professional, honorary organizations. Scholarships. Physical metallurgy laboratory assistant for two years. Three summers with copper company. Prefers research and/or plant management, any location. Available June.

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared by the Technical Information Division of Battelle Memorial Institute, Columbus, Ohio

A General Metallurgical

24-A. Survey of Scrap Preparation in Steel Plants. *American Iron and Steel Institute, Contributions to the Metallurgy of Steel,* no. 48, 1955, 44 p.

Information obtained from questionnaires from 56 steel plants. Tables. (A8, ST)

25-A. Russian Iron and Steel Industry. Robert Shone and W. F. Cartwright. *Iron & Steel,* v. 28, Dec. 1955, p. 655-659.

Productivity and incentives, raw materials and plant equipment. (A general, B10, ST)

26-A. Evaluation of a Waste Pickle Liquor Treatment. T. F. Barnhart. *Iron and Steel Engineer,* v. 32, Dec. 1955, p. 62-65.

New process permits recovery of inhibitors and of the liquor as reusable sulfuric acid, allows use of its only byproduct, iron oxide, by the steel plants. Tables, diagrams. (A8, L12)

27-A. Handling Bulk Materials in Steel Plants. A. H. Andrews. *Iron and Steel Engineer,* v. 32, Dec. 1955, p. 72-82; disc., p. 82-84.

Methods and equipment used to transport and move ore, coal and similar bulk materials. Photographs. (A5, ST)

28-A. Scrap Preparation and Contamination. R. F. Kuhnlein. *Iron and Steel Engineer,* v. 32, Dec. 1955, p. 120-123.

Some problems of scrap contamination and methods for eliminating contaminants. (A8, ST)

29-A. The Increasing Importance of Glass in the Metal Working Industries. *Machinery (London),* v. 87, Dec. 2, 1955, p. 1279, 1328.

Brief survey of aplications of glass in structures, jigs and molds. Use of glass as a lubricant in forging and extrusion operations. (A general, F1, G general)

30-A. Metalworking Facts for 1956. *American Machinist (1956 Production Planbook Issue),* v. 99, Mid-Nov. 1955, p. 1A-16A.

Outlook for the year, based on facts and predictions, regarding expenditures, production, exports, equipment, wages and prices and employment. Graph, tables. (A4)

31-A. Zirconium Metal Fines Recovery. Low Hafnium Zirconium Project. S. C. Ogburn, Jr., and L. J. Reader. *Foote Mineral Company (U. S. Atomic Energy Commission),* NYO 1093, Jan. 1951, 15 p.

Laboratory and pilot plant investigation of recovery of fines resulting from the manufacture of zirconium sponge and zirconium crystal bar. Diagrams, photographs, flowsheet, tables. (A8, C4, Zr)

32-A. Observation and Control of Dust on a Pneumatic Chisel, Portable Abrasive Wheel, and Bench Grinder. W. B. Lawrie, A. T. Holman and E. B. James. *Foundry Trade Journal,* v. 99, Nov. 24, 1955, p. 593-600.

New method of local exhaust ventilation which employs very low air volumes at very high velocities. Tables, diagrams, photographs. 7 ref. (A8, G18)

33-A. Trends in Metallurgical Research in the United States. Edgar C. Bain. *Iron and Steel Institute, Journal,* v. 181, Nov. 1955, p. 193-212 + 7 plates.

Developments in studies of X-ray metallography, analysis of steel by X-ray fluorescence, transformations in sodium, nature of martensite, tempering, effect of boron on hardenability of steel, electron metallography, diffusion mechanisms, dislocations, spiral growth of crystals, fatigue behavior, zone melting and the physical chemistry of steelmaking. Graphs, diagrams, photographs, micrographs. 106 ref. (A general)

34-A. Wet and Dry Filtration Studies — Electric Furnace Ferrosilicon Fume Collection. Leslie Silverman and Robert A. Davidson. *Journal of Metals,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 203, Dec. 1955, p. 1327-1335.

Determines stack concentrations and volumes of material evolved; physical and chemical nature of the collected fume. Describes wet and dry collector studies undertaken to recover the fume. Diagrams, tables. 4 ref. (A8, D5)

35-A. (Polish.) Industrial Safety and Hygiene in Plant Area Activitives of the Openhearth Steel Mill. Jozef Splewinski. *Wiadomosci hutnicze,* v. 11, no. 10, Oct. 1955, p. 311-315.

Storage and handling of charge materials; preparation and flame-cutting of scrap; handling of scrap equipment; general safety rules. (A5, A7, A8, D2, ST)

36-A. (Polish.) China — Industrial Power of the Future. Wladyslaw Gryksztas. *Wiadomosci hutnicze,* v. 11, no. 10, Oct. 1955, p. 321-326.

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

For the sixth anniversary of Red China's regime, author reviews metallurgical progress, including steel work at Anshan southwest of Mukden. Photographs. (A4, ST)

37-A. (Russian.) Heat Exchange in Continuous Furnaces. M. A. Glinkov and A. G. Zen'kovskii. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1955, no. 10, Oct. p. 138-142.

Effect of screen on heat-exchange intensity; efficiency of direct-flow continuous two-zone furnaces; comparison of variations of counter and direct-flow arrangements; calculations of radiant heat exchange. Diagrams, graphs. 2 ref. (A general)

38-A. Control and Treatment of Metal Finishing Wastes. J. C. Hesler. *Metal Finishing (Guidebook—Directory Ed.),* 1956, p. 101 + 9 pages.

Preliminary considerations of material conservation and design. Specific treatments of chromium, cyanide, acid and alkali wastes, oily emulsions and mixed wastes. (A8)

39-A. Activated Carbon Treatment of Plating Solutions. Walter A. Helbig. *Metal Finishing (Guidebook—Directory Ed.),* 1956, p. 396-399.

Uses of continuous and periodical carbon treatment. (A8, L17)

40-A. Modern Reclamation of Non-Ferrous Metals. S. W. Platt. *Metal Industry,* v. 87, Dec. 23, 1955, p. 523-526.

Origin and types of scrap and its distribution. Photographs. (To be continued.) (A8)

41-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 22, Dec. 1955, p. 532-538.

Defines "roke" to "rust remover". Diagrams, tables, graph. (To be continued.) (A10)

42-A. What Metalworking Management Expects in 1956. *Steel (Metalworking Yearbook Issue),* v. 138, Jan. 2, 1956, p. 105-112.

Survey of managers' expectations with regard to employment, selling prices, sales volume, unit cost of manufacturing, capacity, sales and distribution costs, and research for 1956. Tables, graphs. (A4)

43-A. 1956 Metalworking Facts and Figures. *Steel (Metalworking Yearbook Issue),* v. 138, Jan. 2, 1956, p. 145-192.

Figures on production, sales, labor, prices and earnings. Diagrams, graphs, tables. (A4)

44-A. Technical Progress. *Steel (Metalworking Yearbook Issue),* v. 138, Jan. 2, 1956, p. 195 + 100 pages.

Brief comments by metalworking experts in the fields of steelmaking, nonferrous production, materials, metallurgy, heat treating, testing, drives, controls, machining, tooling, forming, cleaning, finishing, joining, packaging, lubrication, service and maintenance. Photographs. (A general)

45-A. (Pamphlet.) **Boron.** Joseph C. Arundale and Flora B. Mentch. 10 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $0.05.

Trade statistics, prices, uses, and technology. Tables. 29 ref. (A4, B)

46-A. (Pamphlet.) **Calcium.** Joseph C. Arundale and Flora B. Mentch. 4 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $0.05.

Trade statistics, prices, uses, and technology. Tables. 8 ref. (A4, Ca)

47-A. (Pamphlet.) **Chromium.** Charles Katlin and Hilda V. Heidrich. 16 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $0.05.

Production, consumption, uses, stocks, prices, trade, and technology. Tables. 19 ref. (A4, Cr)

48-A. (Pamphlet.) **Tungsten.** Robert W. Geehan and Mary J. Burke. 13 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $0.05.

Production, consumption, uses, prices, stocks, trade statistics, and technology. Tables. 24 ref. (A4, W)

49-A. (Pamphlet.) **Uranium, Radium, and Thorium.** John E. Crawford. 42 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $0.05.

Trade statistics, prices, uses, production, and consumption. Maps, tables. 82 ref. (A4, U, Ra, Th)

50-A. (Book.) **Titanium and Titanium Alloys Programs.** v. III-IV. 72 and 121 p. 1955. Air Materiel Command, Wright-Patterson Air Force Base, Ohio.

Outlines, for information to both industrial and government agencies, the conception, objectives, and proposed procedures of the Steering Group on Titanium Research and Development of the Department of Defense and the Titanium Metallurgical Laboratory at Battelle Memorial Institute. Projects completed and in process are listed, giving title and scope, contracting agency, and status of work. (A9, Ti)

51-A. (Book.) **Reports on the Progress of Applied Chemistry.** v. XXXIX. 1125 p. 1954. Society of Chemical Industry, 56 Victoria St., London, S.W. 1, England.

Reviews chemical developments in 1954 to include metallurgy, fuels, biology, textiles, plastics, and food. Pertinent papers are abstracted separately. (A general)

52-A. (Book.) **Ultrasonic Engineering With Particular Reference to High Power Applications.** Alan E. Crawford. 344 p. 1955. Academic Press, 125 East 23rd St., New York 10, N. Y. $8.00.

Theory, methods of generation, and applications with particular reference to metallurgical uses. (A general, S general)

B

Raw Materials and Ore Preparation

15-B. Preparation of Ores. J. M. McLeod. Paper from "Metallurgical Progress—2". Philosophical Library, p. 6-32.

Methods of improving blast furnace burdens, sintering of iron ores, theory of sintering and testing materials, other methods of agglomerating fines and direct smelting processes. 220 ref. (B16, D1, Fe)

16-B. (Italian.) **Testing Strength of Refractories by Sudden Thermal Changes.** A. Giannone and L. Massimilla. *Metallurgia italiana,* v. 47, no. 10, Oct. 1955, p. 461-464.

A number of tests similar to those practiced in America carried out on silica, magnesia and silico-alumina bricks. Graphs, photographs, tables. 3 ref. (B19)

17-B. Difficult Classification Problems Solved With the Dutch State Mines Cyclone. R. E. Hochscheid. *Chemical, Metallurgical & Mining Society of South Africa, Journal,* v. 56, Nov. 1955, p. 197-204.

Four series of laboratory and plant tests. The test should serve as approximate guides to cyclone diameter, feed pressure and capacity, for other classifications involving viscous feeds or fine separations. Photographs, diagrams, tables. 1 ref. (B13)

18-B. The Cyclone as a Gold Concentrator. J. H. French. *Chemical, Metallurgical & Mining Society of South Africa, Journal,* v. 56, Nov. 1955, p. 205-211.

Cyclone employs quieter and less turbulent conditions of flow, which allow freer movement of the fine gold particles through the pulp to the concentrate zone. Tables, graphs. (B14, Au,)

19-B. Special Refractories for Use Above 1700° C. O. J. Whittemore, Jr. *Industrial and Engineering Chemistry,* v. 47, Dec. 1955, p. 2510-2512.

Properties, applications and limitations of pure oxide refractories. Special refractory development is also concentrating on the refractory carbides, borides and nitrides. Tables, photographs. 12 ref. (B19, Al, Mg, Zr)

20-B. Pressure Hydrometallurgy. P. M. J. Gray. *Reviews of Pure and Applied Chemistry,* v. 5, Sept. 1955, p. 194-216.

Developments in chemistry and processes of pressure leaching and pressure precipitation. 46 ref. (B14)

21-B. Engineering Features of Uranium Plant Design. I. S. Craib. *South African Mining and Engineering Journal,* v. 66, pt. 2, Nov. 26, 1955, p. 457 + 5 pages.

Basic process of extracting uranium oxide from the gold-bearing reefs of South Africa; major equipment used in corrosion and abrasion protection; estimates final capital cost and power consumption. Diagrams, photographs, flowsheet, table. (To be continued.) (B general, C general, U)

22-B. Concentration Tests of Selected California-Nevada Manganese Ores. A. L. Engel, H. J. Heinen, Edward Morrice and E. S. Shedd. *U. S. Bureau of Mines, Report of Investigations* 5163, Oct. 1955, 12 p.

Results indicate possible treatment methods or limitations of these methods. Only simple treatments were attempted, such as might be feasible for small operations. Information reported is of interest in the present or future development of ores of these types in their respective localities. Tables. (B14, Mn)

23-B. (Russian.) **Viscosity of Primary and Final Blast-Furnace Slags in Melting of Ferro-Alloys in Blast Furnace.** N. L. Zhilo and L. M. Tsylev. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1955, no. 10, Oct., p. 90-106.

Viscosity-temperature relation for manganese and other slags, from literature and these tests; effect of calcium sulfide, in final slags, on temperature and crystallization rate of slags. Calcium in initial slags impedes process of silicon reduction. Tables, graphs, diagrams. 17 ref. (B21, D1, Fe)

24-B. (Russian.) **Intensification of Enrichment of Magnetite Quartzites.** V. I. Karmazin. *Stahl',* v. 15, no. 11, Nov. 1955, p. 969-976.

Comparative analysis of magnetic separation and flotation, indices of enrichment; cost of operation. Tables, graphs, diagrams, micrograph. 10 ref. (B14, Fe)

25-B. (Spanish.) **Beneficiation of Manganese Ores. Ferromanganese Requirements of the National Steelmaking Industry.** Bernabé Chavarri. *Institutio del hierro y del acero,* v. 8, no. 38, July-Sept. 1955, p. 384-397.

Thermodynamic interpretation of the MnO reduction by carbon. Blast and electric-furnace production of ferromanganese. Graphs, diagram. (B14, D5, P12, Mn)

26-B. (Spanish.) **Obtaining Sulfur, Iron and Other Metals From Pyrite.** Otto Barth. *Institutio del hierro y del acero,* v. 8, no. 38, July-Sept. 1955, p. 406-416.

Preparation of pyrite, chemical transformation processes, roasting, sintering, volatilization, other methods. Tables, graph, diagrams. (B15, B16, Fe)

27-B. Studies in the Recovery of Uranium From Carbonate Solutions. I. Precipitation With Caustic Soda. D. V. Bhatnagar and T. K. S. Murthy. *Journal of Scientific & Industrial Research,* v. 14, sec. B, Nov. 1955, p. 572-576.

Effect of varying the concentrations of sodium hydroxide, sodium carbonate, uranium, phosphate and vanadate, and of temperature on the precipitation of uranium from carbonate solutions. Graphs, table. 7 ref. (B14, U)

28-B. Quemont Mill. *Mine & Quarry Engineering,* v. 22, Jan. 1956, p. 16-21.

Gold concentrating procedures. Photographs, flowsheet. 1 ref. (B14, Au)

29-B. Design and Operation of Callow-Type Flotation Cells at Kennecott's Hayden Concentrator. G. P. Sewell. *Mining Engineering,* v. 7, Dec. 1955, p. 1112-1114.

Equipment and methods. Diagrams, tables. (B14, Cu)

30-B. Fluorochemical Collectors in Flotation. Strathmore R. B. Cooke and Eugene L. Talbot. *Mining Engineering,* v. 7, *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 202, Dec. 1955, p. 1149-1152.

Reagents for nonsulfide ores and for sulfide systems; contact angle measurements. Tables, graphs. 13 ref. (B14)

31-B. A Study of the Factors Affecting the Efficiency of Carbonate Leaching. C. J. Hoffman, W. I. Watson and I. F. Schwien. *Western Laboratories Arthur D. Little, Inc. (U. S. Atomic Energy Commission),* RMO-2617, Mar. 1955, 34 p.

Fineness of ore particle size and maintenance of suitable oxidizing conditions in the leach solution influence the extent of uranium extraction by a sodium carbonate-sodium bicarbonate leach solution. Graphs, tables. 14 ref. (B14, U)

32-B. (French.) **Tests on the Resistance of Refractory Products to Corrosion by Steel and Slag.** J. Massieye and L. Lecrivain. *Bulletin de la société francaise de ceramique,* 1955, no.

28, July-Sept., p. 13-19, 22; disc., p. 20-21.

Apparatus developed to reproduce, on a laboratory scale, actual conditions for corrosion and erosion of refractories. Diagram, photographs. 9 ref. (B19)

C

Nonferrous Extraction and Refining

21-C. Solvent Extraction of Uranium (and Vanadium) From Acid Liquors with Trialkylphosphine Oxides. C. A. Blake, K. B. Brown and C. F. Coleman. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1964, Aug. 1955, 106 p.

A number of symmetrical phosphine oxides were prepared and examined systematically for their ability to extract uranium from acidic nitrate, chloride, sulfate and phosphate solutions and mixtures thereof. Most of the compounds tested showed high affinity for uranium, excellent extractions being obtained from nitrate and chloride solutions, and under the proper conditions from sulfate solutions, including a wide variety of solutions in which the structurally similar tri-alkylphosphates are ineffective. Tables, diagrams, graphs. 37 ref. (C general, U, V)

22-C. (Czech.) Semicontinuous Casting of Ingots of Nonferrous Metals. Rudolf Soucek. *Hutnik*, v. 5, no. 7, July 1955, p. 205-208.

Design and operation of Czech equipment for casting aluminum and aluminum-alloy ingots. Operation and charging of furnaces used in this type of installation. Diagrams. (C5, Al)

23-C. (French.) Preparation of Platinum Metals. P. Egré. *Revue de métallurgie*, v. 52, no. 9, Sept. 1955, p. 691-697.

Survey of recent developments in preparation of platinum, palladium, rhodium, indium, ruthenium and osmium. Photograph, tables, graph. (C28, EG-c)

24-C. (Swedish.) Problems in the Production of Titanium. Gotthard Björling. *IVA tidskrift för teknisk-vetenskaplig forskning*, v. 26, no. 6, 1955, p. 252-257.

Titanium tetrachloride, as the intermediate compound, is reduced by magnesium or sodium after refining. The sponge is melted and cast in a vacuum arc furnace. (C26, C21, Ti)

25-C. Refining Antimony by Electrodeposition and by Distillation. R. R. Rogers and R. A. Campbell. *Canada, Department of Mines and Technical Surveys, Mines Branch, Technical Paper No.* 11, 1955, 14 p.

Degree of refinement by distillation, electrodeposition, and combination of the methods varied with the crude material and refining methods used. Tables, photographs, diagram. 6 ref. (C23, C22, Sb)

26-C. Recent Developments in the Processing of Uranium Ores and Their Significance in the Extractive Metallurgy of Metals. R. R. Grinstead. *Dow Chemical Company, Western Division (U. S. Atomic Energy Commission*, AECU-3071, Sept. 1955, 33 p.

Application of the techniques of solvent extraction processing, possibility of relating uranium recovery developments to methods of extracting other metals from their ores. Diagrams, graphs. (C general, U)

27-C. Continuously Cast Large Bronze Shapes. *Iron Age*, v. 176, Dec. 8, 1955, p. 143-145.

Water-cooled graphite dies and gravity-feed, bottom-flow casting technique produces large bronze bearings, bushings, gears, and other parts that can be machined with minimum waste of time and material. Photographs. (C5, G17, Cu)

28-C. Preparation and Chlorination of Titaniferous Slag From Idaho Ilmenites. Alva H. Roberson and Lloyd H. Banning. *Journal of Metals*, v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 203, Dec. 1955, p. 1335-1342.

Magnesite-lined furnace proved to be more satisfactory for smelting ilmenite in a continuous dry top electric smelting operation than did a carbon-lined furnace. Photographs, tables, diagram. 3 ref. (C21, Ti)

29-C. Electrolysis of Carbonate Leach Solutions. John C. Huggins. *Merrill Company (U. S. Atomic Energy Commission)*, RMO-2607, July 1952, 23 p.

Results demonstrate feasibility of a diaphragm cell for recovery by electrolysis of both vanadium and uranium. Solutions may be derived from the electrolytic operation which are suitable for re-use in a practical cyclic leaching process. Graphs, table. (C23, B14, V, U)

30-C. Production of Hafnium. H. P. Holmes, M. M. Barr and H. L. Gilbert. *U. S. Bureau of Mines, Report of Investigations* 5169, Nov. 1955, 33 p.

With slight modifications, Kroll-process equipment for producing zirconium can be used to produce tonnage quantities of hafnium. Arc-melted metal can be forged and rolled to sheet. Photographs, diagrams, tables. 13 ref. (C4, C26, F22, F23, Hf)

31-C. (French.) Research on the Preparation, by Fused Electrolysis, of Germanium and Some of Its Binary Alloys With the Transition Metals. Marie-Jeanne Barbier-Andrieux. *Annales de chimie (Paris)*, v. 10, Sept.-Oct. 1955, p. 754-806.

Three new methods of preparing germanium consist in electrolyzing sodium digermanate with possible addition of sodium fluoride, germanium oxide dissolved in fused alkaline silicates or germanium oxide dissolved in fused sodium borosilicate. Tables, graphs, photographs. 58 ref. (C23, Ge)

32-C. (German.) Electrolytic High-Grade Purification by Liquid Electrodes. A. Gaumann. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 21, no. 10, Oct. 1955, p. 337-342.

Use of liquid electrodes for purification and separation of metals. Process has been applied to ten metals so far. Indium for example, has been obtained with a purity as high as 99.99995%. Graphs, diagrams. (C23, In)

33-C. (Hungarian.) Some New Data on the Cryolite Baths in Aluminum Metallurgy. Elemér Papp. *Magyar Kémikusok Lapja*, v. 10, no. 11, Nov. 1955, p. 352-353.

Problems of synthetic cryolite; manufacturing suggestions. Tables. 9 ref. (C23, Al)

34-C. (Russian.) Vacuum Method of Eliminating Zinc From Brasses. D. N. Klushin, I. A. Bibina, and K. G. Bogatina. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1242-1246.

Relation of degree of dezincification to time and temperature. Method has advantages of operational efficency and minimum losses of desired metals in the alloy. Diagram, tables, graphs. (C25, Cu)

35-C. Radiochemically Pure Cerium. New Specification of Chemical Purity. Murrell L. Salutsky, H. W. Kirby and Laurence L. Quill. *Analytical Chemistry*, v. 27, Dec. 1955, p. 1960-1962.

Radiochemically pure cerium, as a carrier for tri and quadri-valent ions in extremely low-level radiochemical analyses, prepared by fractional precipitation of the iodate from homogeneous solution, and by fractional crystallization of the double magnesium nitrate and of ceric ammonium nitrate. Tables, graphs, diagram. 5 ref. (C4, Ce)

36-C. A Nuclear Power Plant. Christopher Hinton. *Chemical Trade Journal and Chemical Engineer*, v. 137, Dec. 2, 1955, p. 1504, 1506, 1508.

Design and construction of an English reactor for production of plutonium. (C general, Pu)

37-C. Sodium Uranium (IV) Fluoride; Precipitation and Reduction to Metal. W. B. Tolley. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-39087, Sept. 1955, 13 p.

Determines possibility of precipitating a uranium sodium salt from uranyl solution to obtain some solubility data during precipitation. Classifies structure of compound obtained. Tables, photograph. 5 ref. (C4, U)

38-C. Continuous Electrolytic Tests. John C. Huggins, Robert A. Carlson and Irwin F. Schwien. *Merrill Company (U. S. Atomic Energy Commission)*, RMO-2612, Feb. 1954, 17 p.

Results of operation of a four-stage, continuous laboratory electrolytic unit to recover uranium and vanadium from Monticello carbonate leach solutions. Three runs of 72, 35 and 47 hr. reported, with recoveries of 76 to 90% of the vanadium and 99% of the uranium. Diagrams, table. (C23, U, V)

39-C. The Extraction and Refining of Metals. B. Fullman and F. D. Richardson, editors. Paper from "Reports on the Progress of Applied Chemistry". v. XXXIX. Society of Chemical Industry, p. 129-161.

Survey of advances in inorganic systems and basic physical chemistry. Recent technological advances with the most important metals. 267 ref. (C general)

D

Ferrous Reduction and Refining

34-D. Coreless Induction Furnace. K. Scherzer and F. S. Leigh. *Iron & Steel*, v. 28, Dec. 1955, p. 669-672.

Design, construction and performance data for furnaces now in use in England, Germany and U. S. Graphs, diagrams, photographs. (To be continued.) (D6, C21, ST, Cu, Al, Ni)

35-D. Rational Distribution of Stock in a Blast Furnace. T. An. Tesch. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 125-126, 129, 131.

Selective charging system results in fuel economy, increased production, uniform operation. Table, diagrams, photographs. (D1, ST)

36-D. Electric Steel Production. D. D. Howat. Paper from "Metallurgical Progress—2". Philosophical Library, p. 33-37.

Electric furnace processes, sulfur and hydrogen removal. 48 ref. (D5, Fe)

37-D. (Czech.) **Some Problems in the Construction of Arc Furnaces.** Karel Rosenzweig. *Hutnik*, v. 5, no. 7, July 1955, p. 197-202.

Design and operational features of Czech designed and manufactured electric arc furnaces for the steel industry. Point-by-point comparison with similar furnaces of Russian, American, English and other makes. Diagrams, table, photographs. 4 ref. (D5, Fe)

38-D. (French.) **Processes in the Basic Bessemer Converter.** P. Coheur. *Revue universalle des mines*, v. 11, ser. 9, no. 10, Oct. 1955, p. 484-497.

Modifications of the bessemer process as used today and the influence of such variations on the mechanical properties of the finished product. Tables, diagrams, graphs, photographs. 61 ref. (D3, Q general, ST)

39-D. Measuring By-Product Yield of Coke Ovens. F. R. Pullen. *Instruments and Automation*, v. 28, Dec. 1955, p. 2123-2125.

Measurement of foul gas from coke-oven batteries is of primary interest in determining their operating efficiency where oven design, construction, operation and rebuilding are concerned. Photographs, tables, diagram, graph. (D1)

40-D. Process Measurements Lead to Control of Melting Practices. H. H. Johnson and G. A. Fisher. *Journal of Metals*, v, 7, Dec. 1955, p. 1316-1320.

Stresses importance of uniformity of the furnace charges and weighing accuracy; merit of oxygen for producing the boil; charting the chemistry of steel; carbon control; furnace operation. Photographs, table. 2 ref. (D5, D9, ST)

41-D. Factors in Slag Reduction State Detailed for Stainless Melting Practice. D. J. Carney. *Journal of Metals*, v. 7, Dec. 1955, p. 1321-1323.

For optimum recovery of chromium units the chemical, physical and operational factors must be considered. Photograph. 3 ref. (D5, SS)

42-D. Deoxidizers and Tapping Temperatures in Stainless Steel Production. Charles Yutmeyer. *Journal of Metals*, v. 7, Dec. 1955, p. 1325-1326.

Major portion of the deoxidation in the arc furnace is accomplished with silicon, with ferrotitanium frequently used as a finishing deoxidizer. Recommended bath temperatures given, dependent upon destination of mold heat. Photograph. (D5, SS)

43-D. Non-Metallic Inclusions. H. B. Bell. Paper from "Metallurgical Progress—2" Philosophical Library, p. 48-54.

Considers solubility of oxygen in iron and deoxidation by manganese, silicon, aluminum, titanium, chromium, boron, vanadium and zirconium. Graph. 48 ref. (D2, D9, Fe)

44-D. (Czech.) **Use of Air Enriched by Water Vapor.** Frantisek Houdek. *Hutnik*, v. 5, no. 7, July 1955, p. 194-196.

Czech experiments recommend general application of this device in steel mills because it increases efficiency of blast furnace and lowers relative consumption of coke. Variation of steam content can control chemical composition of the raw iron. Table. (D1, ST)

45-D. (French.) **Reduction of Ores by Gases.** J. Rosier. *Revue de l'institut francais du pétrole et Annales des combustibles liquides*, v. 10, no. 9, Sept. 1955, p. 1115-1125.

Processes currently under study using blast furnace technology as a norm. Tables, graph. 20 ref. (D8, D1, Fe)

46-D. (French.) **Desulfurization With Solid Lime.** Sven Eketorp. *Revue de métallurgie*, v. 52, no. 9, Sept. 1955, p. 718-724.

Sulfur content of sponge iron was lowered from 0.3 to 0.03% with a ½ to 1-hr. treatment at 850 to 900° C. Method applies to desulfurization of molten pig iron. Tables, graphs, diagrams. 16 ref. (D8, CI)

47-D. (French.) **Compactness and Oxygen Content of Effervescent Basic Bessemer Steel Ingots. Comparison of Different Formulas of Effervescent Steel.** A. Delsa. *Revue universelle des mines*, v. 98, ser. 9, no. 11, Oct. 1955, p. 500-508.

Influence of temperature, carbon and manganese additions in the ladle and aluminum in ingot molds on the oxygen content of the products. Compactness of sheet bars studied by torsion tests to determine most favorable conditions of production. Tables. (D3, ST)

48-D. (French.) **Compactness and Oxygen Content of Efferescent Basic Bessemer Steel Ingots. Study of Different Methods of Deoxidation.** F. Classen. *Revue universelle des mines*, v. 98, ser. 9, no. 11, Oct. 1955, p. 509-516.

Influence of anthracite, silico-calcium and solid and liquid ferromanganese deoxidizing agents on the effervescence and compactness of ingots. Tables, graphs. (D3, ST)

49-D. (German.) **Efficiency Problems of Openhearth Furnaces Using the Pig Iron-Scrap Process.** Wilhelm Schmitt. *Stahl und Eisen*, v. 75, no. 24, Dec. 1, 1955, p. 1627-1640.

Qualitative systematic coordination of the most important variables which affect the output of furnaces. Graphs, tables, flow diagram. 25 ref. (D2, ST)

50-D. (Polish.) **How to Attain 7 Million Tons of Steel.** Karol Jezierski. *Wiadomosei hutnicze*, v. 11, no. 10, Oct. 1955, p. 297-298.

Reference made to Russian experiences and outline of improvements and changes advisable for Polish steelmaking. (D general, ST)

51-D. (Polish.) **Methods of Closing the Tap-Hole of Openhearth Furnaces.** Wladyslaw Hansel and Waclaw Dakowicz. *Wiadomosci hutnicze*, v. 11, no. 10, Oct. 1955, p. 299-302.

Advantages and disadvantages of various methods critcally analyzed, including "dry", ash, ore and magnesite methods of closing. (D2, ST)

52-D. (Polish.) **Possibility of Reducing the Heating Time of Silica Openhearth Roofs.** Stanislaw Pawlowski. *Wiadomosci hutnicze*, v. 11, no. 10, Oct. 1955, p. 302-306.

Heat curves for silica roofs; relation of mineralogical composition to specific weight of roof components; strength of roof materials before and after heating. Graphs, tables. 6 ref. (D2, ST)

53-D. (Russian.) **Influence of Reducibility of Self-Fluxing Charge on the Operation of Blast Furnace.** A. M. Bannykh and A. G. Neiasov. *Stal'*, v. 15, no. 11, Nov. 1955, p. 963-968.

Improvement of quality of self-fluxing charge, by increasing its basicity and reducibilty, is a factor to be considered in increasing the furnace operating potential. Such a charge promotes the use of high-temperature blast. Tables. 4 ref. (D1, Fe)

54-D. (Russian.) **Introduction of a Complex Automatic Heat Control System in an Openhearth Furnace Operating on Crude Oil.** V. P. Borodin, V. F. Demenkov, P. E. Darmanian, and A. A. Iudson. *Stal'*, v. 15, no. 11, Nov. 1955, p. 977-983.

Description of system, its components and advantages in comparison with manual and semi-automatic controls. Tables, graphs, diagrams. (D2)

55-D. (Russian.) **Changes in Nitrogen Content in the Electric Arc Furnace Bath With Different Slag Compositions.** F. P. Edneral. *Stal'*, v. 15, no. 11, Nov. 1955, p. 994-1000.

Ways to decrease nitrogen content in electric steels. Tables, graphs, diagrams. 5 ref. (D5, ST)

56-D. (Russian.) **Free Carbon From Coal-Tar Pitches and Its Role in the Preparaton of Electrodes and Electrocarbons.** V. N. Krylov. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov, 1955, p. 1179-1183.

Properties of free carbon in coal tars, its behavior during coking, as well as its role in electrode technology. Table, graph. 6 ref. (D5)

57-D. (Spanish.) **Influence of the Shape of Ingots and Teeming Time of Surface Defects.** Apolinar Herrero. *Instituto del hierro y del acero*, v. 8, no. 38, July-Sept. 1955, p. 365-369.

Necessity of applying different casting methods, depending on shape and size of ingots, and of perfect heat control of the steel before casting. Table, graphs. 1 ref. (D9 CI)

58-D. Cleaning of Open Hearth Stack Gases. Leslie Silverman. *Industrial Heating*, v. 22, Dec. 1955, p. 2506 + 4 pages.

Reports on cleaning methods combining agglomeration of particles and compact filtration. Table. (To be continued.) (D2)

59-D. Survey of Stainless Steel Melting Points up Rapid Progress. Richard B. Shaw. *Journal of Metals*, v. 7, Dec. 1955, p. 1309-1315.

Calculation of oxygen and silicon requirements for the reduction period. Data on the evaluation of curves, and of hydrogen and oxygen effects. Tables, graphs. 11 ref. (D5, SS)

60-D. Electric Furnacemen Talk Shop. *Steel*, v. 138, Jan. 9, 1956, p. 64, 66.

Stainless and heat resisting steel ingotmaking. Photographs. (D5, SS)

61-D. (Hungarian.) **Designing of Blast Furnaces on the Basis of Capacity Calculation and Determination of Economic Coke Requirements.** György Szöke. *Kohaszati lapok*, v. 10, no. 11, Nov. 1955, p. 481-490.

Concept of production capacity of blast furnaces; determination of its factors. Diagram, tables, graphs. (D1)

62-D. (Hungarian.) **Recent Trends in Converting. Possibilities for Introducing It Into Hungary.** Viktor Zsak. *Kohaszati lapok*, v. 10, no. 11, Nov. 1955, p. 490-495.

Critical examination of various processes, oxygen and pig iron requirements. Tables, graphs, diagram. 8 ref. (D3)

E
Foundry

44-E. Large Die-Castings. H. K. Barton. *Metal Industry*, v. 87, Nov. 11, 1955, p. 405-408.

Description and use of large 72-in. die-casting machine. Diagrams, table, photograph. (E13)

45-E. (German.) Classification and Applicability of Core Binder in Foundry Work. Reinhard Grochalski. *Giessereitechnik*, v. 1, no. 4, Apr. 1955, p. 35-41.

Properties, application and characteristics of emulsion, oil, resin and dry binders. Suggests new classification of the latter. Tables, graph, photographs. 8 ref. (E18)

46-E. (German.) Chilled Balls for Ball-Mills. Edwin Bakovsky. *Giessereitechnik*, v. 1, no. 4, Apr. 1955, p. 42-46.

Experimental data for casting balls with a diameter up to 100 mm. Graphs, photographs, micrographs, maps. 4 ref. (E12, CI)

47-E. (German.) X-Ray Microstructure Analysis and Its Application in Tests of Molds and Accessory Foundry Material. Marianne Weidner. *Giessereitechnik*, v. 1, no. 5, May 1955, p. 64-68.

Fundamentals and application of X-ray analysis, especially the Debye-Scherrer method, and its use in foundry testing. Particular attention given to testing clay sedimentation materials. Diagrams, diffractograms. 3 ref. (E18, M22)

48-E. (German.) Basket Box System of Mold-Making. H. Koltz. *Giessereitechnik* v. 1, no. 5, May 1955, p. 73-74.

Basket mold construction, application and its advantages over regular mold making methods. Diagrams, photographs. (E19)

49-E. (German.) Tin Economy Through Replacement by High-Quality Copper Alloys With Low Content of Critical Materials. Helmut Ohmann. *Giessereitechnik*, v. 1, no. 6, June 1955, p. 96-101.

Comparative review of different substitution alloys, their composition, mechanical characteristics and smelting properties in the casting of various types of bronzes and brasses. Tables. (E general, Sn, Cu)

50-E. (German.) The Knock-Out Riser in Light-Metal Casting. Marion Pasternak. *Giessereitechnik*, v. 1, no. 6, June 1955, p. 102-103.

Evaluates applicability of a riser similar to that used in iron casting. Photographs. (E22, EG-a)

51-E. (German.) Cast Steel by Chill Molding. Wolfgang Kilian and Wolfgang Kaiser. *Giessereitechnik*, v. 1, no. 7, July 1955, p. 116-120.

Review of contemporary literature. Tables, graph, diagrams, photographs. 5 ref. (E general, CI)

52-E. (German.) Melting Operations in Gray Iron Casting. Gustav Speer. *Giessereitechnik*, v. 1, no. 9, Sept. 1955, p. 166-168.

Dimensional data of gray iron cupola furnaces, lining techniques, melting process observation, description of air blast and electric furnaces. Table, graph, diagrams. 6 ref. (E10, CI)

53-E. Chevrolet Foundry Has Newest Automatic Equipment. Thomas Mac New. *Automotive Industries*, v. 113, Dec. 15, 1955, p. 50-52.

Equipment, layout and procedures. Among outstanding features are six Grindle cupolas equipped with capped exhaust systems and automatically controlled by a central, single-board panel operated by one worker; specially designed hangers for overhead conveyors; new-type fume and dust collecting machinery. Photographs, diagrams. (E general, CI)

54-E. Foundry Practice. Willam H. Salmon and Eric N. Simons. *Edgar Allen News*, v. 34, Dec. 1955, p. 276-277.

Salvaging of castings, defects in castings and heat treatment. Diagram, micrograph. (To be continued.) (E25)

55-E. Down Come Aluminum Casting Costs. W. G. Patton. *Iron Age*, v. 176, Dec. 29, 1955, p. 61-64.

New casting method process produces castings of a few ounces up to 70 lb. successfully and economically. Castings are accurate, free from porosity, uniformly finished. Photographs, table. (E12, Al)

56-E. Diecasting Dies: The Stacking-Unit System. Hiram K. Barton. *Mechanical World and Engineering Record*, v. 135, Dec. 1955, p. 550-552.

Novel type of unit die with greater capacity that is quicker to set up and dismantle. Diagrams. 2 ref. (E13)

57-E. Moulding Machines. J. B. McIntyre. *Metal Industry*, v. 87, Dec. 9, 1955, p. 483-486.

Classification and characteristics of major types of machines. Diagrams, photographs, table, graph. (To be continued.) (E19)

58-E. Plastic or Metallic? How to Choose the Correct Sealant When Impregnating Porous Castings. D. W. Holmes. *Modern Metals*, v. 11, Dec. 1955, p. 54, 56, 58.

Compares three metallic and one plastic impregnation method, giving procedures, cost of equipment and sealant required and advantages of each method for specific type of porosity. Diagrams, table, photograph. (E25)

59-E. Close Symmetry Held in a 17-Pound Stainless Steel Wedge. *Precision Metal Molding*, v. 13, Dec. 1955, p. 45-46, 80.

Shell mold casting solves production problem. Photograph. (E16, SS)

60-E. (Czech.) Grain Refining of Magnesium Alloys. Ladislav Kubicek. *Hutnické listy*, v. 10, no. 11, Nov. 1955, p. 651-654.

Effect of additions of calcium or calcium carbonate to alloys of magnesium with manganese or aluminum. Tables, photographs, X-ray patterns. 5 ref. (E25, Mg)

61-E. (Czech.) Casting in Permanent Molds Decreases Production Costs. Rudolf Koula. *Slévarenstvi*, v. 3, no. 2, Nov. 1955, p. 341-343.

Advantages of permanent mold casting. Castings adapted to permanent mold production. Factors governing choice of type of mold. 4 ref. (E12)

62-E. (Czech.) Contribution to the Testing of Molding Materials. I. Preparation of Test Pieces, Permeability, Strength. Ladislav Jenicek. *Slévarenstvi*, v. 3, no. 2, Nov. 1955, p. 343-352.

Compacting and strength tests of molding sands. Ramming tests of small specimens. Photographs, diagrams, graphs, tables. 11 ref. (E18)

63-E. (Czech.) Production of Cylinders With Cooling Ribs in Shell Molds. Rudolf Kloda. *Slévarenstvi*, v. 3, no. 2, Nov. 1955, p. 352-356.

Methods, equipment and materials for producing molds and castings. Analyses of causes of defects in castings. Photographs, table, diagram. (E16)

64-E. (Czech.) Mixtures for the Insulation of Risers. Robert Kamensky and Antonin Kubacky. *Slévarenstvi*, v. 3, no. 2, Nov. 1955, p. 356-359.

Test was devised for measuring insulating power of various mixtures. Cupola flue dust was found to have good insulating properties. Photographs, tables, graphs. 13 ref. (E22)

65-E. (Czech.) Moisture and Patterns. Milan Malek. *Slévarenstvi*, v. 3, no. 2, Nov. 1955, p. 359-362.

Improvement of stability of wood patterns by air conditioning the pattern shops, kiln drying the wood, and/or impregnation and coating procedures. Graphs, diagrams. (E17)

66-E. (German.) Relation Between the Mold Composition and the Teeming Ability and Cracking of Cast Steel. Friedrich-Karl Althof and Rudolf Radtke. *Giessereitechnik*, v. 1, no. 7, July 1955, p. 111-115; no. 8, Aug. 1955, p. 136-144.

Relationship between different binding materials in molding sand, amount and type of alloying elements, other factors in cast steel, in respect to its cracking tendency. Tables, graphs, diagrams, photographs, maps. 36 ref. (E19, E23, CI)

67-E. (German.) Application of Intensified Gas Pressure by Use of a Cartridge in Casting. *Giessereitechnik*, v. 1, no. 7, July 1955, p. 123-124.

Method of pressure casting by use of chalk, coke, charcoal and a water cartridge inserted in the mold above the cast metal level. Table, diagrams. 3 ref. (E13)

68-E. (German.) Formation of Tin Scales on Cast Bronze and Red Brass. Edmund R. Thews. *Giessereitechnik*, v. 1, no. 9, Sept. 1955, p. 162-165.

Theoretical explanation of the phenomenon, its possible causes and suggestions for its elimination. Tables, graph, diagram, map. 4 ref. (E25, Cu, Sn)

69-E. (Russian.) Making Hollow Cores in Small-Scale Production. M. I. Rotenberg, V. I. Soldatenko and A. P. Shkarin. *Liteinoe proizvodstvo*, 1955, no. 10, Oct., p. 1-3.

Application of casing molds for small-scale mass casting. It is very economical for production line use, as well as for small-scale operation. Details of mechanization of the process. Tables, diagrams, photograph. (E21, CI)

70-E. (Russian.) Experience in Utilization of Fast Drying Mixtures. F. I. Kotik. *Liteinoe proizvodstvo*, 1955, no. 10, Oct., p. 3-6.

Fast-drying mold materials, their chemical-mineralogical composition and physical data. Tables, graphs. 4 ref. (E18)

71-E. (Russian.) Casting of Iron Parts for Large Lathes. N. I. Averbukh. *Liteinoe proizvodstvo*, 1955, no. 10, Oct., p. 6-10.

Technique of casting heavy parts of large lathes and materials used in the process. Tables, diagrams. (E11, CI)

72-E. (Russian.) Machine Tool for Pressure Casting Model 515. D. M. Litvin. *Liteinoe proizvodstvo*, 1955, no. 10, Oct., p. 13-17.

Construction details of a machine for casting nonferrous metals and their alloys under pressure, including production data. Tables, diagrams. 4 ref. (E13, EG-a)

73-E. (Swedish.) Some Aspects on the Use of Strainer Cores and a Draft Standard for Ceramic Strainer Cores. G. Fernheden and K. Akesson. *Gjuteriet*, v. 45, no. 11, Nov. 1955, p. 157-164.

Form and dimensions of strainer cores, their ceramic composition and design of the gating system. A draft standard for eight round and two rectangular ceramic strainer cores with sizes from 1.5 to 8 cm^2 effective area presented. Photographs, diagrams, tables. 2 ref. (E21, E23)

74-E. Low Cost Gas Turbine Blades a Must for Automobile Use. Donald N. Frey. *Automotive Industries*, v.

114, Jan. 1, 1956, p. 52-53, 109-110.

Low-cost investments and elimination of wax or plastic patterns appears to partially answer the problems involved in producing inexpensive but suitable parts. Photographs. (E15, Al)

75-E. Huge Increase in Investment Castings for Turbojets. Dean K. Hanink. *Automotive Industries,* v. 114, Jan. 1, 1956, p. 58-59, 112-113.

Investment parts are presently used in the hot end of the gas turbine, primarily as larger structural components. Photographs, graph, flow diagram. (E15)

76-E. Nomogram for Fairly-Hot Non-Alloyed Iron Cast In Ordinary Dry-Sand Moulds. Sv. Thegel. *Foundry Trade Journal,* v. 99, Dec. 8, 1955, p. 661-670.

Attempt to combine, in one diagram, composition, hardness and thickness factors for cast iron and their inter-relation with one another, to furnish a method of computing a composition which will provide the properties required in a casting. Graphs, tables. 9 ref. (E11, CI)

77-E. Modern Patternmaking Establishment. *Foundry Trade Journal,* v. 99, Dec. 8, 1955, p. 675-678.

Description of new works of Universal Pattern Co. (London) Ltd. Photographs. (E17)

78-E. Gases in Cast Iron. H. Morrogh. *Foundry Trade Journal,* v. 99, Dec. 22, 1955, p. 723-735.

Examination of techniques employed for determination of gaseous elements in cast iron and for sampling of cast irons for these determinations. Diagrams, micrographs, photograph, tables. (To be continued.) (E25, CI)

79-E. Ingates. *Foundry Trade Journal,* v. 99, Dec. 15, 1955, p. 691-702; disc., Dec. 22, 1955, p. 737-742.

Summary of factors affecting flow through channels carrying the metal to the casting. Diagrams, photographs, tables. 25 ref. (E22)

80-E. Continuous Aluminum Melting Furnace Improves Permanent Mold Casting. A. A. Furczyk. *Industrial Heating,* v. 22, Dec. 1955, p. 2486 + 5 pages.

By eliminating wasteful heating of heavy equipment and large reserves of aluminum, use of an automatic furnace has brought about improved quality of castings, stabilization of production rate, control of foundry costs. Photographs, micrographs, diagrams. (E10, E12, Al)

81-E. GE Remolds a Foundry. *Steel,* v. 138, Jan. 9, 1956, p. 60-61.

Automation in foundry, casting cycles for large and small castings. Photographs. (E general, A5)

82-E. (Hungarian.) **Industrial Experiments With the Production of Spheroidal Graphite Machine Castings. II.** Miklos Cseh. *Öntöde,* v. 6, nos. 11-12, Nov.-Dec. 1955, p. 274-283.

Properties and heat treatment of annealed cast irons, effects of slags, economic considerations. Diagrams, tables, micrographs, graphs. 11 ref. (E general, J general, Q general, CI)

F

Primary Mechanical Working

20-F. Fabrication and Welding of Arc-Cast Molybdenum. Norman E. Weare, Robert E. Monroe and George W. Rengstorff. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1037, Sept. 1955 46 p.

Improved materials and procedures for producing molybdenum weldments with good room-temperature ductility. Diagrams, graphs, photographs, micrographs, flow-sheet, tables. 7 ref. (F general, G general, K general, Q23, Mo)

21-F. High Speed Rod Rolling at Continental Steel Corp. Don C. Horsman. *Iron and Steel Engineer,* v. 32, Dec. 1955, p. 53-59; disc., 59-61.

Production gain is accomplished through multistrand rolling, higher speeds and larger bundles. Equipment and methods. Photographs. (F27, ST)

22-F. Electric Equipment for Reversing Hot Strip Mills. C. C. Thomas. *Iron and Steel Engineer,* v. 32, Dec. 1955, p. 92-109.

Design and construction details for a number of mills now in use in U. S. Diagrams, tables, graphs. (F23)

23-F. Specialty Rolling Mills Have Versatile Control. A. J. Winchester and D. E. Abell. *Iron and Steel Engineer* v. 32, Dec. 1955, p. 144, 147, 148, 150.

Design and construction details of a reversing hot mill and a reversible cold mill with unique control equipment. Photographs, diagram. (F23, ST)

24-F. Flying Shears for Bars and Billets. I. Mechanical Design Features. II. Flying Shears for Bars and Billets. R. Stewartson and S. R. Phelps. *Iron and Steel Institute, Journal,* v. 181, Nov. 1955, p. 232-262 + 5 plates.

Effect of the two different duties on design considered, together with basic linkages for each range, based on oscillatory and rotary motion. Applications and types of electrical controls used. Tables, graphs, diagrams, photographs. 14 ref. (F29, Fe, ST)

25-F. Roller-Straightening of Sections and Rails. W. A. J. Dinwoodie. *Iron and Steel Institute, Journal,* v. 181, Nov. 1955, p. 263-272 + 2 plates.

Theory of straightening by bending and figures from an actual load investigation. Machine design and alternative arrangements. Practical use of straighteners and guides to correct layout given. Diagrams, photographs. (F29, ST)

26-F. Production of Gas Turbine Blades by Precision Forging. E. B. Wells. *Machinery (London),* v. 87, Dec. 2, 1955, p. 1292-1297.

Furnaces, other equipment, methods used. Photographs. (F22, SS, Al, Ni, Ti)

27-F. Extruded Aluminium. *Metal Industry,* v. 87, Dec. 2, 1955, p. 463-465.

Plant and practice at Latchford Works of British Aluminium Co. Ltd. Photographs. (F24, Al)

28-F. Shell Making With the New Look. Robert F. Huber. *Steel,* v. 137, Dec. 19, 1955, p. 88-91.

Forging equipment and operations. Newly designed heat treat handling equipment utilizes completely automatic cycle to harden, quench, draw and cool the shells. Photographs. (F22, J26, ST)

29-F. (Czech.) **Importance of Degree of Deformation in Forging Operations.** M. Sulc. *Strojirenstvi,* v. 5, no. 8, Aug. 1955, p. 589-591.

Influence of degree of deformation on mechanical properties of steel, effect of forging action on grain size. Equations for determining degree of deformation under various types of forging techniques. Graphs, tables, diagram. 3 ref. (F22, Q general, AY, CN)

30-F. Aluminium Extrusion Factory Production Plant Housed in the Product. *Engineering,* v. 180, Dec. 9, 1955, p. 799-801.

New British plant, roofed and walled in aluminum, which houses two large extrusion presses as well as a variety of auxiliary equipment for heat treatment, straightening, and other purposes. Photographs. (F24, T26, Al)

31-F. Water-Lubricated Wood Rolls Bevel Aluminum. A. F. Schub. *Iron Age,* v. 176, Dec. 29, 1955, p. 68-69.

Conventional design advantages, cost factor and speed of a home-grown, two-stand machine. It replaces ten-stand equipment on short production runs. Photographs. (F23, Al)

32-F. Ingot Heat Conservation. Cooling of Rimming-Steel Ingots Between Teeming and Stripping. M. D. Ashton, R. F. Perkins and L. H. W. Savage. *Iron and Steel Institute, Journal,* v. 181, Dec. 1955, p. 303-312.

Method for reducing fuel consumption in soaking pits, increasing pit availability and increasing mold life by stripping all ingots at earliest practical time. Graphs, diagrams, photographs, tables. 10 ref. (F21, ST)

33-F. Glass Lubricant in the Extrusion of Steel. J. Sejournet and J. Delcroix. *Lubrication Engineering,* v. 11, Nov.-Dec. 1955, p. 389-396.

Molten glass is the lubricant in the Ugine-Sejournet process for extruding steel under conditions of high temperature and pressure and facilitates the flow of the metal being deformed. Special conditions under which glass acts as a lubricant, special requirements of this application and responsive properties of glass in this use. Diagrams, photographs, graphs. (F24, F1, ST)

34-F. The Rolling of Metals and Alloys. VIII. Resistance to Deformation During Hot Rolling. E. C. Larke. *Sheet Metal Industries,* v. 32, no. 344, Dec. 1955, p. 939-944.

Plant employed to obtain values of the resistance to deformation needed for computing hot rolling loads. Explanation of construction of groups of curves which relate this property to the rate of deformation, the working temperature and the magnitude of the reduction effected. Graphs, photograph, tables. (To be continued.) 2 ref. (F23)

35-F. (Czech.) **New Measuring Apparatuses in Rolling Mills.** Adolf Uncovsky. *Hutnické listy,* v. 10, no. 11, Nov. 1955, p. 676-678.

Instruments for distance indication of the roll adjustment of the housing, automatic cutting control of pneumatic shearing and registration of the rolling pass plan. Photographs, diagrams. 4 ref. (F23)

36-F. (French.) **Compactness and Oxygen Content of Effervescent Basic Bessemer Steel Ingots Hot-Rolled Into Strip Steel.** M. Nepper. *Revue universelle des mines,* v. 98, ser. 9, no. 11, Oct. 1955, p. 516-520.

Research on flat ingots for rolling into strip steel shows that the compactness of effervescent steel is a direct function of degassing of the pouring basin. Graph, tables, photograph. (F23, ST)

37-F. (German.) **Scaling of Copper Sheets at 400° C.** Karl Löhberg and Fritz Wolstein. *Zeitschrift für Metallkunde,* v. 46, no. 10, Oct. 1955, p. 734-737.

Method of investigating relationship between scaling and cold rolling rate and between texture and deformation stress, time factor of thick and thin cold rolled sheets. Findings and relation to quality of copper sheet. Table, graphs, diagram. 10 ref. (F23, F21, Cu)

38-F. Rolling, Forging Facilities Meet Diversified Needs. R. C. Humphrey. *Iron Age*, v. 176, Dec. 15, 1955, p. 103-105.

Facilities at Westinghouse's new plant are adaptable and multi-purpose, permit wide range of developmental and production work. Photographs. (F22, F23, ST)

39-F. Ceramic Insulation Reduces Roll Maintenance. *Iron Age*, v. 176, Dec. 15, 1955, p. 110.

Roll sleeves, packed with long-life ceramic fiber insulation, hold high-alloy sheets at rolling temperature from furnace to two-high mill. Sleeves spin up to 300 r.p.m. Photograph. (F23)

G
Secondary Mechanical Working

36-G. Roll Formed Sheet Metal Parts. E. J. Vanderploeg. *Materials & Methods*, v. 42, Nov. 1955, p. 100-102.

Metals available, design considerations, cost factors, applications. Photographs. (G11)

37-G. (German.) **Machining of Copper Alloys.** W. Matthey. *Metall*, v. 9, nos. 21-22, Nov. 1955, p. 978-982.

Classification of the alloys into machining groups, types of machining, favorable shaving shape, tool life. Tables, diagrams, photographs. (G17, Cu)

38-G. (Russian.) **Cutting Force in Work With High Feed.** V. F. Paramonov. *Stanki i instrument*, v. 26, no. 10, Oct. 1955, p. 24-26.

Analysis of cutting process and determination of composite factors; elements of wear. Graphs. (G17)

39-G. (Russian.) **Improvement of the Deep Drawing Process for Stainless Steel.** B. Ia. Ketslakh. *Vestnik mashinostroeniia*, v. 35, no. 11, Nov. 1955, p. 51-52.

Selection of optimum hardening methods, selection of most effective lubrication, determination of optimum clearance and degree of surface fineness. Diagrams. 5 ref. (G4, SS)

40-G. Abrasive Belt Grinding of Metals. Hugh N. Dyer. *Industrial and Engineering Chemistry*, v. 47, Dec. 1955, p. 2500-2505.

Some tests on both laboratory and commercial grinding equipment show how metal removal and belt wear vary with different grinding conditions and with different metals. Photographs, graphs. 6 ref. (G18)

41-G. Automatic Size Control. F. R. Boosey. *Instrument Practice*, v. 9, Nov. 1955, p. 1067-1069.

Circuits and description of their functions in machine tool grinding operations. Diagrams. (G18)

42-G. How to Choose the Right Broaching Fixture. Harry Gotberg. *Iron Age*, v. 176, Dec. 8, 1955, p. 135-138.

Choice of work-holding fixture to be used depends on the part itself, production required and machining operations. Discusses most widely used designs of indexing fixtures, shuttles and trunnion devices, with examples of jobs they do best. Photographs. (G17)

43-G. Precision Dies Stamp Difficult Contoured Part. *Iron Age*, v. 176, Dec. 8, 1955, p. 148-149.

A 1½-ton punch insert machined to exact contours used to form intricate sheet steel wheel 5 ft. in diam. Surface at completion of drawing operations is scratch-free and smooth, eliminating the need for further finishing. Manufacturing costs are 80% lower than the original cost of spinning the part. (G4, ST)

44-G. Fluids for Grinding of Titanium. E. J. Krabacher. *Lubrication Engineering*, v. 11, Nov.-Dec. 1955, p. 397-401.

Development of a fluid based on sound metal-cutting principles. A glass-streak test used for screening, since potentially useful grinding fluids prevent wetting of glass by titanium. Micrographs, graphs, and tables. (G18, G21, Ti)

45-G. Coined and Embossed Sheet Metals. Malcolm W. Riley. *Materials & Methods*, v. 42, Dec. 1955, p. 94-97.

Advantages, mechanical properties, fabrication and design, finishes, costs and applications. Graphs, tables, micrographs, photographs. (G3)

46-G. Shot Peening for Safety. *Modern Metals*, v. 11, Dec. 1955, p. 52.

Special methods developed to improve fatigue strength of stress areas in propellers, hub assemblies and other aircraft parts. Photograph. (G23, Q7, Al)

47-G. Abrasive Rolls—New Tools for Metal Finishing. James L. Erickson. *Precision Metal Molding*, v. 13, Dec. 1955, p. 61-62, 64.

Consists of an expendable coil of coated abrasive strip wound and glued tightly together in the form of a roll. Table, photograph, diagrams. (G18)

48-G. Small Piercing Punches. Federico Strasser. *Steel Processing*, v. 41, Dec. 1955, p. 769-771, 798.

Design and materials used in small round punches to decrease problems connected with the use of cutting dies. Diagrams. (G2, ST)

49-G. Cam Machining. Frank W. Hale. *Tool Engineer*, v. 35, Dec. 1955, p. 82-87.

Electronic template and cam machine is capable of following the edge of an electrically conductive live drawing while producing extremely accurate, two-dimensional, milled or ground contours. Diagrams, photographs. (G17, G18)

50-G. Machinery for Sheet Metal Fabrication. John W. Langton. *Welding and Metal Fabrication*, v. 23, Dec. 1955, p. 451-454.

Surveys portions of sheet metalworking field to note any improvements which have been made in design to increase outputs or usefulness. Covers most commonly used items. Photographs. (G2, G6, G15, ST)

51-G. New High-Speed Cutting Material. *Western Machinery and Steel World*, v. 46, Dec. 1955, p. 78-79.

Machining speeds in the 2500 sfm. range predicted with use of cemented oxide. Micrograph, photographs. (G17)

52-G. (Czech.) **For Better Quality of Safety Razor Blades.** Vladimir Sekanina. *Hutnické listy*, v. 10, no. 11, Nov. 1955, p. 665-673.

Czechoslovakian methods for producing razor blades compared with procedures in other countries. Tight production control measures are required to make a high quality product. Tables, micrographs, diagrams. 5 ref. (G general, T10, CN)

53-G. (Czech.) **Strength of Sintered-Carbide Cutting Inserts.** J. Koloc and J. Preisler. *Strojirenstvi*, v. 5, no. 10, Oct. 1955, p. 751-758.

Effect of different moduli of elasticity of cutting tip and tool shank. Factors affecting life of cutting tools. Photographs, tables, graphs, diagrams. 7 ref. (G17, T6, C-n)

54-G. (French.) **Acetylene in Heavy Industry.** E. J. H. Elsworth. *Revue de la soudure (Brussels)*, v. 11, no. 3, 1955, p. 117-125.

Description of industrial practices, which, because of their particular nature, require the utilization of oxy-acetylene. Photographs. (G22)

55-G. (Russian.) **How to Cut Steel Semiproducts and Castings of Great Thickness.** A. N. Shashkov and S. G. Guzov. *Svarochnoe proizvodstvo*, 1955, no. 11, Nov., p. 23-26.

Nature of two processes taking place in metal being cut. Design and operation characteristics of oxygen torches and oxy-cutting machines. Tables, photographs, diagrams. 6 ref. (G22, ST)

56-G. How to Design Die Blocks. J. R. Paquin. *American Machinist*, v. 100, Jan. 2, 1956, p. 88-93.

Eighteen illustrated methods for applying die blocks to small, medium and large cutting dies. Tables, diagrams. (To be continued.) (G1)

57-G. Finish vs. Tool Rake. Max J. Kuderko and Claude A. Potter. *American Machinist*, v. 100, Jan. 2, 1956, p. 115, 117, 119.

Positive rake toolholder is useful for machining soft materials and is helpful to shops using older machines unable to take required cuts with negative rake toolholders. Micrographs, photographs, table. (G17, Al, Cu, CN, AY)

58-G. Special Planer Mills Intricate One-Ton Castings. *Iron Age*, v. 176, Dec. 15, 1955, p. 98-99.

Large castings are rough and finish machined in a multiple series of operations. Two coordinated horizontal milling heads work with two vertical heads to minimize production costs. Photographs. (G17, ST)

59-G. (Japanese.) **On the Shot for Peening. II.** Michira Uchiyama and Kazunori Kamishohara. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1093-1097.

Effect of shot size, hardness and speed on the coverage, peening intensity, surface roughness of the work. Graphs. 5 ref. (G23)

60-G. (Book.) **Fundamentals of Press Tool Design.** W. F. Walker. 152 p. 1955. Philosophical Library, Inc., 15 East Fortieth St., New York 16, N. Y. $4.75.

Identifies and clarifies the fundamental requirements for press operations to permit design of tools which can be operated efficiently and economically. (G1)

H
Powder Metallurgy

12-H. Preparation of Dense Beryllium Oxide. Collin Hyde, John F. Quirk and Winston H. Duckworth. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1020, July 1955, 24 p.

Present research was aimed at developing an active, readily sinterable beryllium oxide powder and to determine some pertinent properties of densely sintered beryllium oxide compacts. Micrographs, graphs, tables. 7 ref. (H15, Q general, Be)

13-H. Characteristics of Copper-Infiltrated Porous Iron. J. E. Elliott. *Metallurgia*, v. 52, no. 313, Nov. 1955, p. 226-234.

Structural changes in the skeleton during infiltration explained in terms of alloying effects. Graphs, tables, maps. 5 ref. (H16, Fe)

14-H. (German.) **Hardenable Bronzes of Copper-Nickel-Tin Basis.** E. Fetz. *Metall,* v. 9, nos. 21-22, Nov. 1955, p. 960-966.

Investigates relation of sintered nickel-bronze composition to powder pressure, cooling time from alpha-phase region after diffusion sintering, pressing. Tables, graphs. 34 ref. (H14, H15, Cu)

15-H. Friction Materials—A New Field for Ceramics and Cermets. R. H. Herron. *American Ceramic Society Bulletin,* v. 34, Dec. 1955, p. 395-398.

Cermet materials have contributed greatly to aircraft brake problems and other less severe applications. Such materials may be the only answer to high-temperature seal and bearing problems. Graphs, photographs. (H general, SG-m)

16-H. Fundamental Study and Equipment for Sintering and Testing of Cermet Bodies: VII. Fabrication, Testing, and Properties of 34 Al_2O_3—66 Cr-Mo Cemets. Thomas S. Shevin and Charles A Hauck. *American Ceramic Society, Journal,* v. 38, Dec. 1955, p. 450-454.

Usefulness in high-stress service to 1800° F. is indicated by stress-rupture behavior, oxidation resistance and thermal-shock resistance. Photograph, graphs, micrograph. 2 ref. (H general, Q4, Al, Cr, Mo)

17-H. Hot Pressed Boron Nitride. K. M. Taylor. *Industrial and Engineering Chemistry,* vol. 47, Dec. 1955, p. 2506-2509.

Body tested resembles graphite in crystalline structure, machining and lubricating properties but differs in temperature strengths and electrical resistivity. Other properties noted. Photograph, graphs, tables. 4 ref. (H14, Q23, P15, B)

18-H. Iron Powder Parts Improved by Heat Treatment. F. L. Spangler. *Materials & Methods,* v. 42, Dec. 1955, p. 102-104.

Steam treatment and carburizing improve strength, corrosion resistance and appearance. Photographs. (H16, J general, Fe)

19-H. Powder Metallurgy Makes Better Reactor Fuels and Components. *Nucleonics,* v. 13, Dec. 1955, p. 24-26.

Techniques and advantages of powder metallurgy for reactor uses. Better resistance to radiation and applicability to unusual combinations are two main reasons for high interest in these methods. Micrographs, diagrams, table. 11 ref. (H general, T25, U, Th, Al)

20-H. (French.) **Sintering of Beryllium Powder.** A. Blainey, T. L. Johnston and J. W. S. Jones. *Revue de métallurgie,* v. 52, no. 9, Sept. 1955, p. 735-749.

Microstructure, mechanical properties and sintering characteristics of several types of powder compared. Graphs, micrographs, photograph, tables. 9 ref. (H10, H15, M27, Q general, Be)

21-H. (French.) **Thermionic Emission of Sintered Mixtures of Powdered Tungsten and Alkaline Earth Carbonates.** G. Mesnard and R. Uzan. *Vide,* v. 10, nos. 58-59, July-Sept. 1955, p. 105-118.

Preparation of cathodes formed with pressed and sintered mixtures; thermionic properties and chemical reactions between components; effects of carbon or nickel additions. Graphs. 4 ref. (H11, P15, W)

22-H. (Russian.) **Dilatometric Investigation of Contraction in Process of Sintering Powder Metals.** V. N. Goncharova. *Metallovedenie i obrabotka metallov,* 1955, no. 3, Sept., p. 51-53.

Investigates linear contraction of the composition iron-graphite-copper during heating up to 1050 to 1070° C. at a rate 200° C. per hr., and cooling in the same furnace. Graphs. (H15, C, Cu, Fe)

23-H. Recent Soviet Research on the Effects of Additives in Alumina Sintering. W. G. Cass. *Ceramic Age,* v. 66, Dec. 1955, p. 16-18.

Liquid phase sintering, relation of melt to sintering, modes of production, precipitation of alumina. 12 ref. (H15, Al)

24-H. Effect of Irradiation on Hot-Pressed Boron Carbide. W. D. Valovage. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-1403, Nov. 1955, 45 p.

Specimens were irradiated in vacuo, in helium and in sodium to determine quantity of helium released and physical stability of the material after burnups as high as 36% of B-10 atoms. Micrographs, diagrams, tables, photographs. (H general)

25-H. Nickel Refining. Sidney Nashner. *Metal Industry,* v. 87, Dec. 23, 1955, p. 527-528.

Operation of major processes at a refinery for nickel powder production. Tables. (H10, C general, Ni)

26-H. Metal Sinterings. *Metal Industry,* v. 87, Dec. 23, 1955, p. 531-533.

Some applications of powder metal process to production of small parts for machinery. Photographs. (H general, T7)

27-H. (English.) **Magnetic Behavior of Fe-Ni Compacts Under Sintering Process.** Hiroshi Kojima. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 3, June 1955, p. 321-328.

Density increase accompanying a rise in sintering temperature was independent of the alloy composition, but the magnetic saturation of higher nickel compact approached the solid alloy's value more rapidly than lower nickel specimens. Graphs. 12 ref. (H15, P16, Fe, Ni)

28-H. (Japanese.) **Powder Metallurgy of Iron and Steel—Review.** Haruo Kubota. *Iron & Steel Institute of Japan, Journal,* v. 41, no. 10, Oct. 1955, p. 1119-1130.

Includes photograph, tables, graphs. 18 ref. (H general, Fe, ST)

29-H. (Book.) **A Handbook of Hard Metals.** W. Hawihl. 162 p. 1955. Her Majesty's Stationery Office, York House, Kingsway, London, W.C. 2, England. $3.50.

Principles of the sintering technique, technical production, and principles for manufacturing hard metals into tools. (H general, T6)

J
Heat Treatment

30-J. Shopmade Flame-Hardening Machine Improves Shaft Quality. Patrick J. Bruno. *American Machinist,* v. 99, Dec. 19, 1955, p. 128-129.

Machine for treating bars and shafts for machine tools. Photographs. (J2)

31-J. Subzero Treatments for Metals. Thomas A. Dickinson. *Metal Treating,* v. 6, Nov.-Dec. 1955, p. 2-4.

Purposes of cold treatment and methods now in use. Photographs. (J26, ST)

32-J. Heat Treating Cold Forgings. Harry A. Kirkpatrick. *Metal Treating,* v. 6, Nov.-Dec. 1955, p. 6-7.

Practice at Hycon Manufacturing Co., Pasadena. Effective use of heat treatment permits cold forging of fin blades for U. S. Navy rockets. (J general, F22, Al)

33-J. Versatile Carburizing Furnace Pays for Itself in 4 Years. W. H. Weinwurm. *Metal Treating,* v. 6, Nov.-Dec. 1955, p. 8-9.

Used for case hardening over 100 different industrial sewing machine parts, this single heat treating furnace is used for producing case depths that vary from 0.005 to 0.0400 in. Photographs. (J28)

34-J. Controlled Atmosphere Instrumentation. R. R. Swain. *Metal Treating,* v. 6, Nov.-Dec. 1955, p. 12, 14.

Use of fuel-air ratio controller, oxygen recorder and other instruments used in providing uniform prepared atmosphere. Diagrams. (J2, ST)

35-J. Heat Treating to Produce Malleable Iron. James H. Lansing. *Steel,* v. 137, Dec. 19, 1955, p. 106-108, 110.

Standard malleable iron from standpoint of composition, types of furnaces used and methods of heating and cooling. Micrograph, photographs. (J general, CI)

36-J. High Convection Annealing for Wire Coils. James L. Whitten. *Wire and Wire Products,* v. 30, Dec. 1955, p. 1481-1485.

High convection system has made it possible to utilize a great deal more heat by convection transfer to the charges. Method is given for applying this increased fuel input to bell-type annealing furnaces used in the wire industry. Diagrams, photographs, tables. (J23)

37-J. (German and French.) **Heat Treatment of Aluminum and Its Alloys.** B. Mauderli. *Aluminium Suisse,* v. 5, no. 5, Sept. 1955, p. 178-191.

Condition and results of treatment in terms of time and temperature; effect of temperature variations and annealing effects after cold plastic deformation. Graphs, tables, micrographs. 1 ref. (J general, Al)

38-J. (Russian.) **Increase of Wear Resistance of Chromium Coating by Carburizing.** V. I. Arkharov and V. N. Konev. *Vestnik mashinostroeniia,* v. 35, no. 11, Nov. 1955, p. 55-57.

Details of carburizing chromium plated surfaces by gasoline vapor at high temperature, and the heat and acid resistance of the resulting surfaces. Tables, graph, micrograph. (J28, L17, Q9, Cr)

39-J. Short-Cycle Heat Treatment. Continuous Production Saves Alloys and Time. James Kniveton. *Automation,* v. 3, Jan. 1956, p. 49-52.

Specialized gas furnace design incorporating instantaneous and efficient control of combustion provides for continuous heat treatment in the manufacture of high-strengh pipe. Photographs, diagrams. (J general, ST)

40-J. The Metallographic View. XVII. Practical Application of Hardenability. Howard E. Boyer. *Steel Processing,* v. 41, Dec. 1955, p. 774-775.

Accepted methods for determining hardenability value and its true meaning, factors which influence it as applied to actual practice. Graphs. (J26, ST)

41-J. Materials Handling at High Temperature. *Steel Processing,* v. 41, Dec. 1955, p. 793-796.

Diversified heat treating operations illustrate how modern high-volume heat treating practice is being mechanized with aid of high-alloy castings. Photographs. (J general, A5, ST)

42-J. (Czech.) **Effect of Heat Treatment on Quality of Forged Billets.** Emanual Paral. *Hutnik*, v. 5, no. 7, July 1955, p. 202-204.

Various types of heat treatment for regular and high-quality steels, including recommended procedures for normalizing, isothermal annealing, stress-relieving. (J23, J24, J1, ST)

43-J. (German.) **Thermal Treatment of Temperable Copper-Nickel-Silicon Alloys.** K. Dies. *Metall*, v. 9, nos. 21-22, Nov. 1955, p. 955-959.

Relation between cooling condition and hot hardening; mechanical values and structure at low temperatures. Tables, graphs, micrographs. (J29, Cu, Ni, Si)

44-J. (German.) **New Process of Annealing Brass Strip in Continuous-Heating Furnace.** Th. Münker. *Metall*, v. 9, nos. 21-22, Nov. 1955, p. 967-971.

Construction and operation of furnace and results obtained. Graphs, diagram, photographs. 3 ref. (J23, Cu)

45-J. (Russian.) **Location of Cold Shortness Threshold in Case of Annealing Brittleness.** V. I. Prosvirin and E. I. Kvashnina. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 17-20.

With the origin of annealing brittleness, the threshold of cold shortness is displaced toward higher temperatures. Longer times of high-temperature annealing induces a shift of the cold shortness threshold to lower temperatures but increases grain size. Graphs, micrographs. 4 ref. (J23, Q23, AY)

46-J. (Russian.) **Microstructure of Cast High Speed Tool Steel.** P. M. Iushkevich and S. A. Fedorova. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 21-25.

Changes in structutre during gradual heating up to 1315° C. after quenching in water. Formation of tungstide and carbide inclusions. Micrographs. 8 ref. (J29, M27, TS)

47-J. (Russian.) **Dependence of Anisotropy of Mechanical Properties of Steel on the Annealing Temperature.** Shen' Siao Tsin. *Stal'*, v. 15, no. 11, Nov. 1955, p. 1022-1024.

General relationship between anisotropy of a series of steels and conditions of heat treatment, in particular, the temperature and time of annealing. Tables, graphs. 10 ref. (J23, Q general, ST)

48-J. Selective Surface Hardening. J. L. Harris. *Australasian Engineer*, 1955, Oct. 7, p. 45-52.

Four methods of flame hardening, materials suitable for flame hardening, equipment used, results obtained, costs. Diagrams, graphs, tables, photographs. 7 ref. (J28, J2, ST)

49-J. Mechanized Batch Type Furnaces. Martin Neumeyer. *Industrial Heating*, v. 22, Dec. 1955, p. 2444 + 11 pages.

Principal advantages of the furnace include better metallurgical control, flexibility of processing, cost savings in equipment and portability. Photographs, diagrams, tables. (J general)

50-J. Induction Heating Speeds Case Hardening. G. B. Kiner. *Iron Age*, v. 176, Dec. 15, 1955, p. 106-107.

Local hardening to a case depth of 0.030 in. is effectively controlled by an induction heating setup. Scanning spray mechanism case hardens long workpieces evenly. Photographs. (J2, ST)

51-J. Ultrasonics: Effects on Steel Heat Treatment. H. V. Fairbanks and F. J. Dewez, Jr. *Iron Age*, v. 176, Dec. 8, 1955, p. 139-142.

Grain refining effect of ultrasonic energy applied to mild steel during heat treatment is important theoretically and commercially, since it tends to modify the classical theory of how crystals can be altered. Commercially, ultrasonics provides a new control technique for many heat treating processes. By increasing diffusion rates, sonic energy might greatly speed carburizing, carbonitriding, nitriding and chromizing. Micrographs, diagram, graphs. (J28, ST)

52-J. Modern Reheating and Heat-Treatment Furnace Practice. M. W. Thring. *Metal Treatment and Drop Forging*, v. 22, Dec. 1955, p. 507-514.

Problems of the efficient burning of fuels in heating furnaces and their economic operation. Special reference made to principles of oil firing and methods of improving simple heating systems. Diagrams. 13 ref. (J general, F21)

53-J. Hot-Work Tool Steels. E. Bishop. *Metal Treatment and Drop Forging*, v. 22, Dec. 1955, p. 519-524.

Survey of post-war German developments and the extensive experimental research in softening of such steels during long-period holding at various temperatures within the tempering range. Graphs, tables. 5 ref. (J 29, Q general, TS)

54-J. How to Understand Annealing and Hot Working of Metals. Samuel Storchheim. *Metalworking Production*, v. 99, Dec. 23, 1955, p. 2169-2176.

Basic essentials and theory of hot working and annealing. Graphs, diagrams, micrographs, tables. (J23, F general)

55-J. (English.) **On the Mechanism of Boron Hardenability.** Yunoshin Imai and Hikotaro Imai. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 7, no. 3, June 1955, p. 249-261.

Adsorption of boron atoms on an austenite grain surface appears to fill up lattice defects, thus reducing internal strains. Micrographs, tables, graphs. 11 ref. (J26, AY)

K

Joining

46-K. Welding of Molybdenum Heat Exchangers. Robert E. Monroe and David C. Martin. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1019, July 1955, 12 p.

Production of complex welded components in currently available arc-cast molybdenum is feasible. Table, photographs, diagrams. 2 ref. (K1, Mo)

47-K. Problems Associated With the Design and Construction of Wind Tunnels. E. F. Burford. *British Welding Journal*, v. 2, Dec. 1955, p. 541-549.

Welding aspects of the design and construction of a high-speed and a low-speed wind tunnel. The high-speed tunnel, required for use at near to supersonic speeds, is powered by three jet engines. Special factors that had to be considered were the high operating temperatures, the possibility of pronounced vibration, drumming and noise. The low-speed tunnel is of orthodox design and is fan-driven. Diagrams, photographs. (K1)

48-K. Procedures and Joint Preparation for Welded Storage Tanks. Charles Osicka. *Industry & Welding* v. 28, Dec. 1955 p. 46-48, 51, 76.

Fabrication of cement-storage tanks. Photographs, diagrams. (K1, CN)

49-K. Testing Welded Metal Joints. S. W. Hollingum. *Metal Industry*, v. 87, Nov. 11, 1955, p. 401-404.

Preparation of standard test samples, testing by determination of mechanical properties and by observation of microstructure; nondestructive test methods. Diagrams, micrographs. (To be continued.) (K9, Q23, M27, S general)

50-K. Weldability. J. F. Mercer. *Metal Industry*, v. 87, Dec. 2, 1955, p. 471-472.

Factors involved and tests employed to determine weldability of metals in general. 1 ref. (K9)

51-K. Mechanized Welding Goes Ahead in Aero-Engine Production. F. G. C. Sandiford. *Metalworking Production*, v. 99, Dec. 9, 1955, p. 2084-2089.

Machines which were built to meet problems of handling large and accurate assemblies in heat resisting materials used in gas-turbine and similar propulsion units for aircraft. Photographs, diagrams. (K1, K3)

52-K. An Analysis of the Behaviour of Riveted Joints in Aluminium Alloy Ships' Plating. A. R. Flint. *North East Coast Institution of Engineers & Shipbuilders, Transactions*, v. 72, Dec. 1955, p. 83-122.

Elastic behavior, strength and watertightness tested. Tables, graphs, diagrams. 18 ref. (K13, AI)

53-K. (French.) **Longitudinal Induction Welding of Cold Formed Tubes.** A. Fischer. *Soudage et techniques connexes*, v. 9, nos. 9-10, Sept.-Oct. 1955, p. 229-232; disc., p. 233-235.

Automatic welding installation and optimum conditions for operation; advantages of the method. Table, diagrams, photographs. (K6)

54-K. (French.) **Welding of Discharge Pipe Lines in France.** R. Bouchayer. *Soudage et techniques connexes*, v. 9, nos. 9-10, Sept.-Oct. 1955, p. 243-252; disc. p. 252-254.

Selection of method for the particular material; standards for pipeline material. Table, photographs. (K1, S22)

55-K. (German.) **Butt-End Gas Welding of Gray Cast Iron.** Leo Hütter and Heinz Neumann. *Giesserei*, v. 42, no. 22, Oct. 27, 1955, p. 605-609.

Shows the basic possibility of welding when upsetting is done correctly. Relation between the welding factors and durability of welded joint. Diagrams, photographs, micrographs. 9 ref. (K2, CI)

56-K. (German.) **Arc Welding of Copper and Its Alloys in an Inert Gas Atmosphere.** W. Mantel and L. Wolff. *Metall*, v. 9, nos. 21-22, Nov. 1955, p. 942-946.

Current consumption for welding, preheating, properties of items welded in argon. Table, graphs, diagrams, photographs. (K1, Cu)

57-K. Embrittlement of Multipass Welds in Zircaloy 2. John T. Niemann and Raeman P. Sopher. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1006, June 1955, 18 p.

Embrittling effect does not appear to be large enough to be serious. Ductility can be improved by post-weld heat treatment. Diagrams, photographs, micrographs, tables. (K1, K9, Zr)

58-K. Joint Design for Joining Tubes to Tube Sheets for Corrosive Radioactive Chemical Service. W. R. Smith. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-37983, Aug. 1955, p. 4-18.

Joints have been developed which are suitable for cases where either the corrosive solution is in contact with the inside or the outside of the tubes. These joints can be produced economically with minimum skills and can be consistently reproduced with a high degree of integrity and reliability. Diagrams, photographs, tables. (K general)

59-K. Resistance Brazing Replaces Soft Soldering. Dave Ritchie. *Industry & Welding,* v. 28, Dec. 1955, p. 58-60.

Brazing machines and operating procedures for silver brazing electrical components. Photographs. (K8, Ag-d)

60-K. New Epoxy Adhesive. Bernard Gould. *Materials & Methods,* v. 42, Dec. 1955, p. 140, 142.

A one-component thixotropic formulation applicable to production metal bonding. Table, photographs. (K12)

61-K. Mechanized Welding Makes Aero-Engines. I. F. G. C. Sandiford. *Metalworking Production,* v. 99, Dec. 2, 1955, p. 2041-2045.

Methods of fusion and resistance welding. Describes and illustrates machines now in use. Photographs, diagrams. (K1, K3)

62-K. Inert-Gas Metal-Arc Process Applied to the Welding of Stainless Steel. C. Lewis Railton. *Welding and Metal Fabrication,* v. 23, Dec. 1955, p. 455-464.

Porosity, effect of feed speed and current on the arc, butt and fillet welds and welding conditions for mechanical testing of welds. Micrographs, diagrams, tables, photographs. 4 ref. (K1, SS)

63-K. Refrigeration Equipment Assemblies. Application of Special Resistance Welding Plant. N. Maylin. *Welding and Metal Fabrication,* v. 23, Dec. 1955, p. 472-474.

Plant and technique problems encountered in applying resistance welding to production of refrigeration equipment. Special welding equipment described and illustrated. Photographs, diagrams. (K3, ST, Al)

64-K. Distortion in Welding. I. Electric Arc Welding. W. T. Amison. *Welding and Metal Fabrication,* v. 23, Dec. 1955, p. 475-477.

Techniques intended to minimize distortion; summarizes various methods by a series of rules. Diagrams. (To be continued.) (K1, ST)

65-K. (Czech.) **Effect of Flame Smoothing on the Propertes of Steels.** A. Strachota. *Strojirenska vyroba,* v. 3, no. 7, July 1955, p. 293-295.

Effects of flame smoothing of welds and heating during welding of sheet steel. Explanations of recrystallization and structural changes during cooling. Graphs, table. (K2, N5, Q23, ST)

66-K. (Czech.) **Preheating When Welding Steels Under High-Temperature and High-Pressure Conditions.** J. Vrtel. *Strojirenstvi,* v. 5, no. 7, July 1955, p. 518-525.

Factors affecting crack formation include hardenability, austenitic and bainitic transformations, thermal cycle of welding, stresses from shrinking during cooling, hydrogen content. Graphs, tables, micrographs. 10 ref. (K general, N8, AY)

67-K. (French.) **Autogenous Methods Using Gas. Welding and Brazing. Cutting. Surface Treatment. Heat Treatment.** H. von Hofe and H. Killing. *Revue de la soudure (Brussels),* v. 11, no. 3, 1955, p. 126-136.

Optimum conditions of operation and fields of application. Tables, diagrams, photographs. (K2, K8, G22, J2)

68-K. (French.) **Arc Welding Under Flux of Thick Material.** L. Dubois. *Soudure et techniques connexes,* v. 9, nos. 9-10, Sept.-Oct. 1955, p. 259-268; disc. p. 268-269.

Optimum conditions depending on characteristics of materials. Testing of welded seams. Tables, diagrams, photographs, micrographs. (K1)

69-K. (German.) **Resistance-Welding Electrodes of Beryllium-Copper With Silver Additions.** Theodor Fuchs. *Schweisstechnik,* 9, no. 9, Sept. 1955, p. 106-108.

Physical and chemical properties of electrodes and their practical application. Photographs. (K3, T5, Be, Cu, Ag)

70-K. (Russian.) **Progress in Welding Techniques and Technology.** *Svarochnoe proizvodstvo,* 1955, no. 11, Nov., p. 1-2.

Surveys Russian accomplishments, new methods, suggested lines of advancement and improvements, and indication of certain hindrances and shortages (oxygen, calcium carbide, etc.). (K general)

71-K. (Russian.) **Further Developments of Automatic Welding.** B. E. Paton. *Svarochnoe proizvodstvo,* 1955, no. 11, Nov., p. 3-8.

Operation and applications of the up-to-date Russian welding machines and devices, including mobile welding units for semi-submerged arc welding of thick-sheet aluminum and its alloys. Photographs, diagrams. (K general, K1, Al)

72-K. (Russian.) **Causes for the Formation of Pores During Electric Arc Welding of Silumin.** I. E. Gnedovskii. *Svarochnoe proizvodstvo,* 1955, no. 11, Nov., p. 13-15.

Factors affecting and recommendations for avoiding porosity. Graphs, micrographs, diagram. 1 ref. (K1, Al)

73-K. (Russian.) **Welding at the Bryansk Locomotive Construction Works.** Z. L. Klimovitskii. *Svarochnoe proizvodstvo,* 1955, no. 11, Nov., p. 16-19.

Design and operation of automatic equipment in use, various types of welding employed. Diagrams, table, photographs. (K1, ST)

74-K. (Russian.) **Welding of Steel 1Kh18N9T in Atmosphere of Protective Gases With Formation of Root of Butt Welds Without Back-Up Blocks.** M. D. Tiul'kov. *Svarochnoe proizvodstvo,* 1955, no. 11, Nov., p. 20-22.

Electrical conditions for argon or helium-shielded nonconsumable tungsten electrode welding of straight or curved pieces. Tables, diagrams, photographs. (K1, AY)

75-K. (Slovak.) **Welding in the Vacuum Industry.** Werner Espe. *Zvaranie,* v. 4, no. 7, July 1955, p. 196-207.

Electric-resistance, and cold, arc, and flame welding methods used in the construction of high-vacuum and gas-filled electron tubes. Conditions demand use of great amounts of hydrogen and rare gases and eliminates use of fluxes. Photographs, tables, graph, diagrams. 50 ref. (K general)

76-K. (Slovak.) **Basic Principles of Heat Propagation in the Welded Joint.** Andrej Havalda. *Zvaranie,* v. 4, no. 7, July 1955, p. 215-218.

Characteristics of electric arc as a source of heat; calculation of heat in a certain point of a stationary field. Graphs. 3 ref. (K1)

77-K. Spotwelding in the Handley Page Herald. *Aircraft Production,* v. 18, Jan. 1956, p. 18-27.

Manufacturing techniques developed for attaching components of primary structure. Diagrams, graphs, micrographs, photographs, tables. (K3)

78-K. How to Use Fluxes and Solders for Good Joints. W. P. McQuillan. *American Machinist,* v. 100, Jan. 2, 1956, p. 81-84.

Corrosive and noncorrosive fluxes, solder alloy composition, effects of residual flux, means for removing flux, joint strength versus temperature, other details. Graphs, micrographs, table. (K7)

79-K. Inert Gas Welding of Aluminum Alloys. II. M. J. Waite. *Canadian Metals,* v. 18, Dec. 1955, p. 44, 46-48.

Welding procedures, properties of weldments, quality control, economic considerations, applications in transportation, chemical and electrical industries, also in pressure vessels and machinery. Photographs. (K1, T general, Al)

80-K. High-Temperature Furnace Brazing. D. M. Dovey and K. C. Randle. *Metal Treatment and Drop Forging,* v. 22, Dec. 1955, p. 501-505.

Brazing method without a flux based on use of a controlled atmosphere. Micrographs, photographs, tables. 5 ref. (K8)

81-K. History of the Coated Electrode. John J. Chyle. *Welding Engineer,* v. 41, Jan. 1956, p. 25-27.

Changes that have been made in welding tools during the past 30 years. Photographs. (K1)

82-K. Welding Positioners Set the Stage for Weld Quality and Greater Speeds. Ernest L. Richmond. *Welding Engineer,* v. 41, Jan. 1956, p. 33-36.

Salient points to consider in selection and application of positioning equipment, which may be identified as welding or work positioners, headstocks and tailstocks and turning rolls. Photographs, diagrams. (K1)

83-K. The How and Why of Adhesive Bonding. I. Samuel N. Muchnick. *Welding Engineer,* v. 41, Jan. 1956, p. 42, 44.

Review of conditions for adhesive bonding. Photographs, graph. (To be continued.) (K12, Al, Mg, SS)

84-K. Miles of Piping Are Tig Welded. Morris P. Rosen. *Welding Engineer,* v. 41, Jan. 1956, p. 46, 48.

Phases involved in the country's welding of one of the largest stainless steel piping networks. Photographs. (K1, SS)

85-K. How to Weld High-Pressure Vessels With Automatics. Wilmer W. Weber. *Welding Journal,* v. 34, Dec. 1955, p. 1161-1166.

Experience proves submerged arc automatics reduce costs, improve working conditions, increase production and quality. Recommendations for its application to pressure vessel welding, since it meets all code requirements. Photographs. (K1, ST)

86-K. Electrode Activation for Inert-Gas-Shielded Metal-Arc Welding. A. Lesnewich. *Welding Journal,* v. 34, Dec. 1955, p. 1167-1178.

Use of extremely dilute, invisible coatings of the alkali, alkaline earth and rare earth elements, or certain oxides, to electrodes, stabilizes metal transfer and modifies deposition rate, penetration and size and shape of weld bead. Application of coatings extended to all industrial metals. Photographs, graphs, tables. 17 ref. (K1)

87-K. Manual-Arc Welding of Butt Joints in Crane Rails. Ivan Kutuchief. *Welding Journal,* v. 34, Dec. 1955, p. 1179-1184.

Wear and deformation on rail ends corrected by use of covered metal-arc electrodes. Photographs, table, diagrams. 1 ref. (K1, ST)

88-K. Engineering Aspects of Inert-Gas Tungsten-Arc Welding of Piping. Helmut Thielsch and C. S. Pulliam. *Welding Journal,* v. 34, Dec. 1955, p. 1185-1195.

Effects of joint design and purging, root-pass cracking, limitations of inspection techniques, advantages of consumable welding insert rings. Photographs, diagram, micrographs, tables, graph, X-ray radiograms. 3 ref. (K1)

89-K. Mechanical Properties of Modified Type 347 Weld Metals. *Welding Journal,* v. 34, Dec. 1955, p. 583S-595S.

Evaluates ability of the electrodes to meet standard fabrication codes, determines tensile and notch impact properties before and after exposure to elevated temperatures. Diagrams, tables, micrographs, graphs. 10 ref. (K9, Q6, SS)

90-K. Measurement of Shunting Currents in Series Spot Welding 0.036-in. Steel. E. F. Nippes, W. F. Savage and S. M. Robelotto. *Welding Journal,* v. 34, Dec. 1955, p. 618S-624S.

Effects of spot spacing, electrode and backing bar geometries, material preparation and electrode force on size and distribution of shunt currents. Tables, photograph, diagrams, graphs. 8 ref. (K3, ST)

L

Cleaning, Coating and Finishing

77-L. Vacuum Metallizing—Modern Midas Touch. Robert N. Sheets and William M. Stocker, Jr. *American Machinist,* v. 99, Dec. 19, 1955, p. 105-108.

Use in manufacture of plastic toys, electronic equipment, automotive accessories, household appliances, business machines, decorative papers. Photographs. (L23)

78-L. Get the Most Out of Vapor Degreasing. Charles E. Kircher and T. J. Kearney. *Steel,* v. 137, Dec. 19, 1955, p. 92-93.

Criteria for selecting proper equipment and solvent for specific applications. Photographs, table. (L12)

79-L. No Acid in This Pickle Line. *Steel,* v. 137, Dec. 19, 1955, p. 96, 98.

Stainless and heat resisting steels turn bright after special salt bath and atmosphere heating. Working properties are comparable to acid-pickled alloys. Graph, table. (L12, ST)

80-L. The Protection of Structural Steel. Physical Examination of Paints in Relation to Their Practical Performance. H. W. Talen. *Chemistry & Industry,* 1955, no. 49, Dec. 3, p. 1564-1574.

Results of investigations relating to the effect of weathering on a number of paints. Diagrams, graphs, tables. 4 ref. (L26, R3, ST)

81-L. The Protection of Structural Steel. Long-Time Tests Carried Out by the Swedish Committee on Corrosion With Painted and Galvanized Steel Plates Exposed to Air. P. Nylén and K. F. Trägardh. *Chemistry & Industry,* 1955, no. 49, Dec. 3, p. 1574-1587.

Reports test methods and results, effects of methods of application, pretreatment and galvanizing procedures. Map, tables, micrographs, graphs. 3 ref. (L26, R3, ST)

82-L. Study of Copper Anodes in Acid and Cyanide Plating Baths. William H. Safranek and Charles L. Faust. *Plating,* v. 42, Dec. 1955, p. 1541-1546.

Utilizing high-purity cast anodes overcomes the disadvantage of electrolytic copper with respect to fastening hooks. The cast anodes dissolve uniformly and create less scrap, and are supplied in longer lengths. Particle roughness is reduced, and as a result diaphragms have been eliminated in some installations. Tables, graphs. (L17, Cu)

83-L. Liquid Honing as a Surface Conditioning Operation. William C. Ehlert, G. Kauffman and G. Burrett. *Plating,* v. 42, Dec. 1955, p. 1522-1524.

Equipment, methods, uses and advantages of liquid abrasive blasting. Photographs, maps. (L10)

84-L. Treatment of Anodizing Wastes by Ion Exchange. Lacern M. Corcoran. *Sewage and Industrial Wastes,* v. 27, Nov. 1955, p. 1259-1261.

Treatment by chemical and ion exchange methods. Ion exchange is more economical. Includes rinse water system. Photograph, table. (L19)

85-L. Diffused Nickel Cadmium as a Corrosion Preventive Plate for Jet Engine Parts. Ralph W. Moeller and William A. Snell. *Plating,* v. 42, Dec. 1955, p. 1537-1540.

Engineering application, on a production scale, of 0.0003-in. nickel plus 0.0001-in. cadmium, diffused at 630° F., for low alloy steel parts for engine parts operating at temperatures up to 1000° F. Micrographs, photographs. (L17, Cd)

86-L. Corrosion Protection of Magnesium Alloys. Maurice Hardouin. *Metal Industry,* v. 87, Nov. 11, 1955, p. 408-409.

Properties and application procedures for paints and primers. 1 ref. (L26, Mg)

87-L. Nickel-Plated Steel Sheet and Plate. L. L. Williams. *Materials & Methods,* v. 42, Nov. 1955, p. 112-114.

A new corrosion-resistant, workable material suitable for process equipment where product contamination is a factor. Photographs. (L17, L22, CN)

88-L. Fluorocarbon Dispersion Coatings. Gene Bartczak. *Materials & Methods,* v. 42, Nov. 1955, p. 90-95.

These coatings are finding acceptance in industry because of their unique chemical, physical and mechanical properties. Tables, photographs. (L16)

89-L. Electroplated Metals on Niobium. John G. Beach and C. L. Faust. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1004, May 1955, 7 p.

Columbium was activated for adherent plating by electrolytic etching in a hydrofluoric acid solution. Arsenic-electroplated iron on columbium was difficult to pry off. Heat treatment after baking provides excellent bonds. Photographs. 4 ref. (L17, Cb)

90-L. (Czech.) Cladding of Thin Sheets With Stainless Steels. Josef Teindl. *Hutnik,* v. 5, no. 7, July 1955, p. 204-205.

To economize on nickel and chrominum, carbon steel sheet is clad with stainless steel. Heating, rolling, and welding steps in cladding. Tables, diagrams. (L22, SS, CN)

91-L. (Italian.) Copper Cementation With Beryllium. G. Venturello and V. Coen. *Metallurgia italiana,* v. 47, no. 10, Oct. 1955, p. 453-460.

Use of a copper-beryllium alloy coating on copper parts provides the electrical and thermal conductivity of copper with the hardness, wear resistance and scale-free properties of the copper-beryllium alloy. Graphs, table, maps, diagram. 11 ref. (L15, P15, P11, Q29, Q9, Cu, Be)

92-L. (French.) Electrolytic Deposits on Platinum Metals. E. H. Laister. *Revue de métallurgie,* v. 52, no. 9, Sept. 1955, p. 698-705.

Details of solutions and technique for platinum, palladium, and rhodium plating. Table. (L17, Pt, Pd, Rh)

93-L. (French.) The Electrochemical Behavior of Monocrystalline Surfaces. Electrochemical Deposition and Etching on the (0001) Face of Pure Zinc. L. Cavallaro and G. P. Bolognesi. *Revue de métallurgie,* v. 52, no. 9, Sept. 1955, p. 706-710.

Macroscopic and microscopic studies relate surface characteristics with current density. Micrographs. 8 ref. (L17, M21, M28, Zn)

94-L. (German.) Possibility of Utilization and Techniques of Anodic Polishing of Copper Alloys. J. Elze. *Metall,* v. 9, nos. 21-22, Nov. 1955, p. 983-990.

Process is applicable to polishing, deburring, ridge removal and surface cleaning. Tables, graphs, photograph, micrographs. 3 ref. (L13, Cu)

95-L. (French and German.) Cleaning by Ultra Sound. F. Held. *Pro-Metal,* v. 7, no. 47, Oct. 1955, p. 564-569.

Cleaning methods, limitations in use of ultrasonics. Diagrams, table, micrographs, photographs, drawings. (L10)

96-L. New Chrome Finish Cuts Part Handling and Cleaning. T. P. McFarlane. *Iron Age,* v. 176, Dec. 1, 1955, p. 103-105.

"Crack-free" process incorporates a low-cost bath and requires no copper or nickel undercoating. Photographs. (L17, Cr, Zn)

97-L. The Protection of Structural Steel. L. A. Ravald. *Chemistry & Industry,* 1955, no. 48, Nov. 26, p. 1526-1535.

Removal of mill scale and metallizing in the pretreatment of steel; metal coatings and paint systems as protective methods. Table. 15 ref. (L12, L26, ST)

98-L. The Protection of Structural Steel. Principles of Protective Painting. G. Dechaux. *Chemistry & Industry,* 1955, no. 48, Nov. 26, p. 1535-1541.

Corrosion of metal structures exposed to the weather and sea water; comparison of polished unpainted steel, rough unpainted steel and painted steel; formulation and appraisal of the efficiency of anticorrosive paints. Diagram, graphs, micrographs. 12 ref. (L26, R3, R4, ST)

99-L. Hydrogen Contamination in Descaling and Acid Pickling of Titanium. G. A. Lenning, C. M. Craighead and R. I. Jaffee. *American Society for Metals, Transactions,* v. 48, *Preprint No.* 33, 1955, 10 p.

Increased ratio of surface area to mass and increased bath time will cause an increase in hydrogen absorption by titanium. In Virgo bath, no hydrogen pickup occurred, but surface pitting was evidenced. Tables. 4 ref. (L12, Ti)

100-L. The Protection of Structural Steel. I-II. Practical Experience of Protection by Sprayed Metal Coatings. W. E. Ballard and F. A. Rivett. *Chemistry & Industry,* 1955, no. 50, Dec. 10, p. 1606-1615.

Techniques of applying zinc and aluminum coatings for maximum possible protection. Photographs, table. (L23, Al, Zn)

101-L. The Protection of Structural Steel. The Use and Weldability of Aluminum Sprayed Steel. H. F. Tremlett and W. A. Johnson. *Chem-*

istry & Industry, 1955, no. 50, Dec. 10, p. 1616-1617.

Precautions necessary with aluminum-coated steels in regard to welding operations. Table. 4 ref. (L23, K9, ST)

102-L. The Protection of Structural Steel. The Protection of Steelwork in Chemical Factories. F. R. Himsworth. *Chemistry & Industry*, 1955, no. 50, Dec. 10, p. 1618-1622.

Considers painting, sprayed metal coatings and other forms of protection and economic considerations involved. Table. (L26, L23, ST)

103-L. Continuous Anodic Oxidation of Copper Wire. Dallas T. Hurd, James G. Krieble and H. G. Pfeiffer. *Industrial and Engineering Chemistry*, v. 47, Dec. 1955, p. 2483-2491.

Black copper oxide applied to copper wire, by continuous electrolytic oxidation in hot alkaline solution, appears to meet all requirements of a good barrier substrate for the higher operating temperatures of electrical apparatus. Diagrams, graphs, table, photographs. 6 ref. (L19, Cu)

104-L. Metallic Coatings on Non-Metallic Materials. IV. Vacuum Coating Methods. *Industrial Finishing (London)*, v. 9, Oct. 1955, p. 160, 162.

Three basic techniques and equipment required. Photographs, table. (L25)

105-L. Electrodeposition of Tin and Tin Alloys. R. M. Angles. *Industrial Finishing (London)*, v. 9, Nov. 1955, p. 202 + 5 pages.

Uses of tin and its applications in the preparation of alloys, its usefulness as a protective coating in industry. Diagram, photographs, table. (L17, Sn)

106-L. Metallic Coatings on Non-Metallic Materials. V. Metallic Paints. *Industrial Finishing (London)*, v. 9, Nov. 1955, p. 214, 216, 218, 220.

Methods of metallizing glass, ceramics and similar materials. Considers way in which application and firing of metallic paints have been stimulated by the development of new uses in radio and electronics. Table. (L23)

107-L. Bituminous Paints Prove Their Worth by Achieving a High Waterproof Finish. *Industrial Finishing (London)*, v. 9, Nov. 1955, p. 228, 230.

Includes micrographs, photograph. 1 ref. (L26)

108-L. Barrel Plating Setup Combines High Output With Versatility. G. W. Harding. *Iron Age*, v. 176, Dec. 29, 1955, p. 65-67.

New plating system alters thicknesses every 15 min. by an automatic device. It handles batch-load specifications up to 20,000 lb. hourly. Photographs. (L17, Zn)

109-L. Lacquer or Enamel? John B. Campell. *Materials & Methods*, v. 42, Dec. 1955, p. 88-92.

Choice of finish will significantly affect unit costs and performance quality. Photographs, graph. 12 ref. (L26)

110-L. Sprayed Metal Coatings in Product Design. D. A. Watson. *Materials & Methods*, v. 42, Dec. 1955, p. 106-109.

Metallizing is now finding uses in original product manufacture for wear resistance, solderability and corrosion resistance. Photographs, tables. (L23, K7, SS, AY, CI, Fe, Al, Cu, Zn, Mo)

111-L. The Heat Resistance and Applications of Hot Dip Aluminized Steel. M. L. Hughes and D. F. G. Thomas. *Metallurgia*, v. 52, no. 313, Nov. 1955, p. 241-245.

Procedure and results of heat and scaling resistance tests using steel prepared by the Aldip process. (L16, Al, ST)

112-L. A Working Guide to Selecting and Applying Surface Protection for Die Castings. *Precision Metal Molding*, v. 13, Dec. 1955, p. 66-70, 72.

Specific types and characteristics of chemical and electrolytic coatings. Table, photographs. (L14, L17)

113-L. Some Successful Applications of Electrolytic Polishing in Industry. R. Mondon. *Sheet Metal Industries*, v. 32, no. 344, Dec. 1955, p. 923-931, 934.

Properties of electrolytically polished metal surfaces; applications of process to various production problems. Micrographs, photographs, diagrams, graphs. 12 ref. (L13, Fe, Ni-g, ST)

114-L. Hot-Tinning Cast Iron. C. J. Thwaites. *Tin and Its Uses*, 1955, no. 33, p. 5-6.

Direct chloride method developed for certain high-phosphorus irons found not to be amenable to tinning by the fused chloride salt-bath method due to their susceptibility to over-treatment. It has since been found to be generally applicable to gray cast irons and has been used successfully for Meehanite and spheroidal graphite irons. Photograph. (L16, CI, Sn)

115-L. Tin Alloy Coatings as Alternatives to Nickel-Chromium. S. C. Britton. *Tin and Its Uses*, 1955, no. 33, p. 10-12.

Reports results obtained in extensive exposure trials carried out by Tin Research Institute. Micrographs. (L17, Sn, Cu, Ni, Cr, ST)

116-L. (English.) Studies on the Growth, Form, and Structure of Electrodeposited Metals. Gösta Wranglén. *Svensk kemisk tidskrift*, v. 67, no. 10, 1955, p. 463-471.

Dendrite growth, throwing power, metal powder electrodeposition, structure of electrodeposited iron. Table, diagrams, photographs, micrographs. (L17, M27, Fe)

117-L. (Czech.) Metallurgical Remarks on the Production and the Use of Preserve Tins. Josef Teindl and Dagmar Zajoncova. *Hutnické listy*, v. 10, no. 11, Nov. 1955, p. 654-662.

Factors causing defects in tin cans, including coating, thickness variation, metal purity, desire to conserve tin supplies, soldering. Dependence of coating adherence on iron-tin intermediate layer. Diagrams, tables, micrographs. 23 ref. (L16, T10, Sn)

118-L. (French and German.) Chemical and Electrolytic Polishing of Surfaces. P. Grivel. *Pro-Metal*, v. 7, no. 47, Oct. 1955, p. 570-579.

Critical review of methods and their applications. Tables, diagrams, photographs, drawings. 9 ref. (L12, L13)

119-L. (French.) Continuous Anodizing as Applied to Aluminum Wire. N. D. Pullen. *Revue de métallurgie*, v. 52, no. 9, Sept. 1955, p. 731-734.

Necessity for specifications to control quality in this high-speed operation. Photograph. (L19, Al)

120-L. (Russian.) Study of Corrosion Stability and Wear Resistance of Calorized Steel. S. G. Bogdanov. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 25-31.

Experimental investigation of corrosion resistance of the calorized surface in acids, salt water vapors and oxidizing atmosphere at high temperatures. Wear resistance of calorized surface investigated by friction with steel. Graphs, tables, diagrams, photographs. 2 ref. (L15, R5, R3, Q9, ST)

121-L. (Russian.) Electropolishing in Oxalic Acid Electrolytes. D. V. Pletnev. *Vestnik mashinostroenia*, v. 35, no. 11, Nov. 1955, p. 58.

Use of oxalic acid electrolytes for electropolishing, comparison with other type reagents. Composition and optimal working ratio. (L13)

122-L. (Russian.) Criterion on Evenness of Metal Distribution on the Cathode. L. I. Kadaner. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1174-1178.

Effect of interelectrode distance on current density; polarizability of cathode. Diagram. 9 ref. (L17, Cr, Ni)

123-L. (Russian.) Ferrocyanide Electrolyte for Silvering. V. I. Semeriuk. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1240-1242.

Silver deposits are dense, finely crystalline, easily polished and cling well to base metal of copper and brass. This electrolyte also permits thick depositions of 30μ and more without intermediate roughing. 3 ref. (L17, Ag)

124-L. (Spanish.) Metallization. Salvador Maria Checa Casajus. *Instituto del hierro y del acero*, v. 8, no. 38, July-Sept. 1955, p. 374-383.

Equipment, methods of surface preparation, metallization process, mechanical properties of coatings, applications and defects. Diagrams, photographs, micrographs, table. 8 ref. (L23, Al, Cu, Ni, ST, Zn)

125-L. The Deposition of Thin Films of Gold on Cylindrical Specimens by Sputtering. F. R. Lipsett. *British Journal of Applied Physics*, v. 6, Dec. 1955, p. 442-444.

Apparatus and procedure for gold deposition on cadmium wires of 1 mm. diam. Diagram, table. 3 ref. (L25, Au)

126-L. Tentative Recommended Specifications and Practices for Coal Tar Coatings for Underground Use. *Corrosion*, v. 12, Jan. 1956, p. 75-76.

Coating requirements, coal tar primer and enamels applications of coal tar coatings to pipe. Table. (L26, S22)

127-L. Nickel Plating by Direct Chemical Deposition. *Corrosion Technology*, v. 2, Dec. 1955, p. 377-379.

A more flexible and direct method of plating by chemical deposition from appropriate solutions. Its main features are superior corrosion resistance to normal electroplating and extreme simplicity, since no electrical equipment is needed; however, it is not quite as economical as electroplating. Photograph. 9 ref. (L14, L17, Ni)

128-L. Electroless Nickel Plating and Its Applications. Bosdorf. *Electroplating and Metal Finishing*, v. 8, Dec. 1955, p. 415-417, 428.

Process in an acid and alkaline solution based on nickel chloride and sodium hypophosphite. Rate of deposition is a function of time in both solutions; deposit thickness increases with increase in nickel or hypophosphite up to a limiting value. Tables, graphs, photographs, micrographs. 5 ref. (L14, Ni)

129-L. The Protective Value of Paints on Steel. *Electroplating and Metal Finishing*, v. 8, Dec. 1955, p. 426-428.

Tests were conducted on 250 paints in industrial and marine atmospheres. Covers priming paints, metallic pigments and lead soaps in primers, effect of surface preparation and metallic coatings on paint systems, tar and bitumen paints. (L26, ST)

130-L. Porcelain Enameled Aluminum. *Foote Prints*, v. 27, no. 2, 1955, p. 3-7.

Basic manufacturing principles, advantages, and uses. Photographs. (L27, T26, Al)

131-L. Use of Radio-Active Isotopes in the Study of the Permeability of Paint and Varnish Films. C. K. N. Nair, P. G. Sharma and J. S. Aggarwal. *Journal of Scientific & Industrial Research*, v. 14, sec. B, Nov. 1955, p. 549-552.

Radio-active tracers provide a convenient tool in evaluating paint and varnish compositions. Rubidium-86 was used to determine permeability of coatings by distilled and 'synthetic' sea water. Tables. 4 ref. (L26, S19, Rb)

132-L. Plating Room Layout. J. J. Martin, Jr. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 11 + 4 pages.

Basic equipment design and layout. (L17)

133-L. Plating Room Floor Construction. Robert S. Mercer. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 20, 22-25.

Base floor, impervious interlines, surface or protective sheathing and drainage. Diagram. (L17)

134-L. Mechanical Exhaust for Plating Rooms. B. F. Postman. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 25 + 11 pages.

General specifications for exhaust systems used in different plating room processes, exhaust system constituents. Diagram, graph. (L17, A5)

135-L. Essentials of Plating Rack Design. William E. Belke. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 41 + 9 pages.

Primary factors to consider for specific applications in production plating. Diagrams, tables. (L17)

136-L. Electrical Power for Plating. I. Motor-Generators. II. Rectifiers. III. Plating Tank Wiring. William E. Schwarz, James A. Viola, William E. Bryan and Nathaniel Hall. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 54 + 14 pages.

Types of and controls for motors, generators and rectifiers, wiring systems. Diagrams, graphs, table. (L17)

137-L. Corrosion Resistant Tanks and Linings. Milton Nadel. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 77 + 6 pages.

Evaluates wood, plastic, glass, ceramic, concrete and steel for tanks, various linings for steel tanks. Table. (L general)

138-L. Heating Plating Solutions. G. B. Hogaboom, Jr. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 87-88.

Means for computing boiler horsepower needed to fill B.t.u. requirement of plating tank. Necessary tank coil dimensions and burner capacities presented in tabular form. 2 ref. (L17)

139-L. Cooling of Plating Solutions. Mary Rubinstein. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 90, 92-95.

Cooling methods and cooling calculations for baths. Tables. (L17)

140-L. Agitation of Plating Solutions. Mary Rubinstein. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 96-101.

Air and mechanical agitation, solution circulation, convection and ultrasonics with regards to materials and constituents used. (L17)

141-L. Polishing and Buffing. H. L. Kellner. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 117 + 9 pages.

Polishing materials and equipment, burring, brushing and buffing. Table. (L10)

142-L. Surface Finishing the Stainless Steels. Lester F. Spencer. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 136 + 7 pages.

Basic characteristics and types of stainless steels; commercial mill finishes. Table. (L10, G19, SS)

143-L. Abrasives and Compounds for Polishing and Buffing. Howard J. McAleer. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 148 + 6 pages.

Types of abrasive materials, buffing compounds and binders. (L10)

144-L. Abrasive Blasting. Victor F. Stine. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 157-165.

Impact blasting is used to replace pickling, electrochemical cleaning, hand finishing. Methods and equipment for applying abrasives with air and in liquid. (L10)

145-L. Barrel Finishing. Peter L. Veit. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 166 + 18 pages.

Brief history, terminology, theory, selection, conditioning and the size of media, barrel types, design, maintenance methods. Diagrams. (L10)

146-L. Solvent Vapor Degreasing. G. W. Walter. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 189-196.

Solvents, degreasing apparatus, degreasing cycles, operating methods, maintenance, testing and ultrasonic degreasing. Diagrams. (L12)

147-L. Solvent Recovery and Conservation. Max Randall. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 198, 200.

Methods for recovering solvents in a degreaser and in a still. Factors to consider in conserving the solvent. Table. (L12)

148-L. Metal Cleaning. S. Spring. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 200 + 11 pages.

Cleaning metals with chemical agents, particularly alkaline, in preparation for electroplating. Micrographs, table. (L12, L17)

149-L. Pickling and Acid Dipping. Nathaniel Hall. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 218-226.

Dip and/or pickling formulas for cadmium, iron, steel, silver, stainless steel, titanium and for aluminum, copper, magnesium, nickel, zinc, and their alloys. (L12, Cd, Fe, Ag, SS, Ti, Al, Cu, Mg, Ni, Zn)

150-L. Preparation of Basis Metals for Plating. Nathaniel Hall. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 226-234.

Cleaning, dipping, plating steps for steels, zinc die castings, aluminum, stereotypes, slush castings, leaded-brass and bronze, lead. (L17, L12, ST, Zn, Al, Cu, Pb)

151-L. Electroplating on Magnesium Alloys. Myron B. Diggin. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 243-249.

Surface conditioning, activating pickling, zinc immersion coating, copper striking, standard plating constitute the basic steps required in magnesium plating. 2 ref. (L17, L12, Mg)

152-L. Cyanide Cadmium Plating. R. O. Hull. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 254, 256, 258.

Solution compositions, general operations, equipment, deposition rates. 5 ref. (L17, Cd)

153-L. Chromium Plating. George Dubpernell. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 260 + 6 pages.

Ornamental, industrial, high-speed, basket, barrel and porous chromium plate. Micrographs. (L17, Cr)

154-L. Acid Copper Plating. Louis Packman and A. T. Marinaro. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 272, 275-276.

Techniques that have proven successful in bright nickel plating are being applied to copper with excellent results but the inherent disadvantage of this type of solution is that steel and zinc parts require a strike or flash coating from a cyanide-type copper bath. (L17, Cu)

155-L. Cyanide Copper Plating. Barnet D. Ostrow and Fred I. Nobel. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 276 + 6 pages.

Includes tables. (L17, Cu)

156-L. Fluoborate Copper Plating. A. E. Carlson and Clifford Struyk. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 287-288.

Bath composition and formulation, operating conditions, maintenance, control. (L17, Cu)

157-L. Gold Plating. Edward A. Parker. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 290 + 8 pages.

Decorative plating, antique golds, variables in gold alloy plating, throwing power of gold solutions, industrial gold plating, testing of deposits. 4 ref. (L17, Au)

158-L. Indium Plating. Daniel Gray. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 302-305.

Both formulations for sulfate, fluoborate, sulfamate, cyanide baths. 23 ref. (L17, In)

159-L. Iron Plating. Almo D. Squitero. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 305-311.

Chloride, sulfate, fluoborate baths. 3 ref. (L17, Fe)

160-L. Lead Plating. F. C. Mathers. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 311-317.

Fluosilicate, fluoborate, sulfamate, other acid baths, alkaline lead baths. 41 ref. (L17, Pb)

161-L. Lead-Tin Alloy Plating. A. E. Carlson and Clifford Struyk. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 317-320.

Lead and tin fluoborate analyses, bath composition, preparation, control. (L17, Pb, Sn)

162-L. Nickel Plating. Walter H. Prine. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 321-322, 324-330.

Plating solutions of a nonproprietary nature usually used for a specific purpose. Suggested corrections for plating difficulties. Graphs. 5 ref. (L17, Ni)

163-L. Bright Nickel Plating. E. B. Saubestre. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 330, 332-338.

Plating for decorative purposes. Organic bright nickel, nickel alloy, highly buffable nickel baths, PR plating, electro-polishing. Tables. 37 ref. (L17, L13, Ni)

164-L. Black Nickel Plating. A. T. Marinaro and Louis Packman. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 338-339.

Used primarily for appearance and color, the deposit thickness is about 0.00005 in. and is therefore not durable. Solution composition and operating conditions. (L17, Ni)

165-L. Palladium Plating. Harold Robinson. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 340-341.

Composition of sodium palladium nitrite, diammino nitrite, acid chloride baths. Greatest application is in the electronics field. (L17, Pd)

166-L. Platinum Plating. Harold Robinson. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 341-342.

"P" salt bath and chloroplatinic acid bath. (L17, Pt)

167-L. Rhodium Plating. Harold Robinson. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 342-345.

Composition of phosphate, sulfate, heavy deposit baths; barrel rhodium plating process. Graph. (L17, Rh)

168-L. Ruthenium Plating. Harold Robinson. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 346.

Deposits can be produced to 0.0015 in. thickness. Bath formula for satisfactory deposits. (L17, Ru)

169-L. Silver Plating. N. E. Promisel. *Metal Finishing Guidebook—Directory Ed.)*, 1956, p. 346 + 5 pages.

Makeup and operating conditions for a strike solution and three plating solutions; effects of different factors on solution properties and operation; high-speed plating baths; work treatment. (L17, Ag)

170-L. Tin Plating From Acid Baths. F. C. Mathers. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 353-357.

Three solutions. Pickling, anodes, addition agents, sludge control. 41 ref. (L17, Sn)

171-L. Tin Plating From the Fluoborate Bath. A. E. Carlson and Clifford Struyk. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 358-359.

Bath composition and operating conditions. (L17, Sn)

172-L. Tin Plating From Alkaline Stannate Baths. Frederick A. Lowenheim. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 359-365.

Distinguishes between sodium stannate and potassium stannate baths; solution composition for still tank and barrel plating. Control and maintenance, temperature, voltage, sludge, plating time, equipment, quality control. 1 ref. (L17, Sn)

173-L. Tin-Nickel Alloy Plating. Frederick A. Lowenheim. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 366-368.

Deposit characteristics, solution composition, equipment, operation and control, stripping. 3 ref. (L17, Sn, Zn)

174-L. Plating Tin-Zinc Alloys. Frederick A. Lowenheim. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 368-372.

Formulations for still tanks and automatics and for barrels, specifications for working conditions, anodes, current-time relationships, control and influence of variables. (L17, Sn, Zn)

175-L. Acid Zinc Plating. R. O. Hull. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 372-373.

Solution composition and maintenance, operating conditions. Acid zinc plating provides a smooth, white, rust-resistant coating. (L17, Zn)

176-L. Cyanide Zinc Plating. R. O. Hull. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 373-375.

Solution composition and maintenance. 1 ref. (L17, Zn)

177-L. Barrel Plating Fundamentals. H. J. Struckhoff. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 376, 378, 380.

Equipment, material, contacts, load, area, speeds, current. (L17)

178-L. Plating on Plastics. Harold Narcus. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 380-385.

Chemical reduction, mirror spray, and metal evaporation methods. 16 ref. (L23, L25)

179-L. Filtration of Plating Solutions. Harold W. Faint. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 387 + 4 pages.

Filter aids and trouble shooting pointers for suction lines, pumps, valves. (L17)

180-L. Rinsing Techniques. Joseph B. Kushner. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 399-404.

Calculating amount of rinse water necessary for multiple tank rinsing with and without cascade feeding. Wetting agents, size and design of rinse tanks, automatic rinse control. Diagram, graphs. 8 ref. (L17)

181-L. Immersion Plating. Nathaniel Hall. *Metal Finishing (Guidebook—Directory Ed.)*, 1956. p. 410-413.

Formulas and bath temperatures for arsenic, brass, cadmium, cobalt, copper, gold, lead, nickel, silver and tin plating on various metals. 8 ref. (L16)

182-L. Electroless Nickel. Harry J. West. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 414-415.

Provides formulas for still tank and barrel operations using acid and alkaline-type solutions. (L14, Ni)

183-L. Electropolishing. Charles L. Faust. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 415-424.

Advantages, limitations, costs, general procedures, commercial methods, equipment. Diagram, tables. 8 ref. (L13)

184-L. Stripping Metallic Coatings. Nathaniel Hall, G. B. Hogaboom, Jr., and J. B. Mohler. *Metal Fininshing (Guidebook—Directory Ed.)*, 1956, p. 426-428, 430-434.

Formulas for stripping brass, cadmium, copper, chromium, gold, bronze, lead, nickel, rhodium, silver, tin, tin-zinc alloy, zinc and oxide and phosphate coatings from metals. (L12)

185-L. Anodizing Aluminum. Nathaniel Hall. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 435-438.

Outlines chromic acid, sulfuric acid and hard anodizing processes, cites conditions under which each is applicable. Graph. (L19)

186-L. Coloring Anodized Aluminum. Frank P. Stiller. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 439-440, 442-443.

Equipment, rinsing, sealing, shade, dyeing conditions, surface preparation, multicolor anodizing, lightfastness of dyed coating. (L19, Al)

187-L. Surface Treatments for Magnesium. Myron B. Diggin. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 443-463.

Cleaning, pickling, mechanical finishing, paint base, black, electrochemical and other treatments, assembly protection, organic coatings, specifications. Tables. 1 ref. (L general, Mg)

188-L. Chromate Coatings. Walter E. Pocock. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 464 + 8 pages.

Aids in selection and operation of suitable treatment for any given application. Tables. (L14)

189-L. Chemical Conversion Coatings. S. Spring. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 477-481.

Desired characteristics and functions of phosphate coatings, types and methods of application, factors influencing crystal size, sealing and operational cycles. (L14)

190-L. Control of Plating Baths With Plating Cells. R. O. Hull. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 500-503.

Testing procedure, observation and variables controllable by the Hull Cell. Diagrams, graphs. (L17)

191-L. pH Control. Everett A. Hodges. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 503-504, 506-508.

Colorimetric and electrometric methods for testing pH of plating baths. 4 ref. (L17)

192-L. Pickling Processes Reviewed. II. Choice of Plant. D. J. Fishlock. *Product Finishing*, v. 8, Dec. 1955, p. 52-68, 104.

Plant and facilities involved in processes. Diagrams, graphs, table, photographs. (To be continued.) (L12)

193-L. Electropolishing Methods for Silver and Gold. J. M. Leslie. *Product Finishing*, v. 8, Dec. 1955, p. 69-75.

Chief processes. Graphs, table. 16 ref. (L13, Au, Ag)

194-L. Hard Chromium Plating of Tool Steels. A. W. F. Comley and T. E. Such. *Product Finishing*, v. 8, Dec. 1955, p. 76-80, 104.

Pretreatment methods and plating baths used. Graph, photograph, tables. (L17, TS, Cr)

195-L. Inert-Gas Metal-Arc Welding Clads 102-In. Propeller. C. S. Sherman. *Welding Journal*, v. 34, Dec. 1955, p. 1196-1197.

Propeller company saves time, cuts cost using inert arc welding to build up nickel-vanadium steel. Photographs. (L24, K1, AY-q)

196-L. Crack Arresting by Overlays of Notch-Tough Weld Metal. P. P. Puzak and W. S. Pellini. *Welding Journal*, v. 34, Dec. 1955, p. 577S-581S.

Test results indicate that cladding of a brittle steel by such deposits imparts a high order of resistance to the initiation and propagation of brittle fracture. Photographs, micrographs, graphs. 5 ref. (L24, Q26)

197-L. Advantages of Phosphate Coatings in Fastener Forming. John H. Geyer and Hugh Gehman. *Wire and Wire Products*, v. 30, Dec. 1955, p. 1490-1493, 1528-1532.

Coatings have helped make practical the use of true-size rod in nut forming; certain effects and benefits are realized in forming specialty bolts, screws and rivets or in other difficult operations; extensive tool life increase is indicated. Photographs, flowsheet. (L14, ST)

198-L. Electrodeposition. A. E. Davies. Paper from "Reports on the Progress of Applied Chemistry". v. XXXIX. Society of Chemical Industry, p. 117-128.

Results on 13 specific metals and on porous metals, metal powders, alloys. General theory. 160 ref. (L17)

M

Metallography, Constitution and Primary Structures

39-M. Surface Metallography Solves Production Problems. A. T. Steer. *American Machinist*, v. 99, Dec. 19, 1955, p. 109-120.

Use of high-power magnification to determine causes of failure in storage or service. Photographs, micrographs. (M21, S21)

40-M. X-Ray Microscopy. W. C. Nixon. *Research*, v. 8, Dec. 1955, p. 473-483.

Development, merits and limitations of each, form of X-ray microscopes, based on the principles of reflection, contact and projection. Diagrams, photographs, micrographs. 102 ref. (M21)

41-M. (French.) Direct Microscopic and Electronic Diffraction Examination of Metals. R. Castaing. *Revue de métallurgie*, v. 52, no. 9, Sept. 1955, p. 669-675.

Specimens thin enough to allow for direct and high resolution elec-

tron-microscope examination and for simultaneous inspection by means of localized electron diffraction are prepared by ion bombardment. Micrographs, photograph, diagram. 12 ref. (M21, M22)

42-M. (German.) Investigation of the System Vandium-Arsenic. K. Bachmayer and H. Nowotny. *Monatshefte für Chemie,* v. 86, no. 5, Oct. 1955, p. 741-744.

Determination and crystallographic specifications of a new crystal type having a composition similar to that of V_2As. Tables. 9 ref. (M24, As, V)

43-M. (German.) Fundamental Relationship Between Dislocation Density and Stress Functions. Ekkehart Kröner. *Zeitschrift für Physik,* v. 142, no. 4, 1955, p. 463-475.

Mathematical analysis of fundamental equations of non-symmetrical dislocations. Diagrams. 6 ref. (M26, Q25)

44-M. (Italian.) Structural Changes Produced by Phosphorus in Complex Hypereutectic Heat Resisting Al-Si-Ni-Cu-Mg Alloys. U. Gandolfi and D. Gualandi. *Metallurgia italiana,* v. 47, no. 10, Oct. 1955, p. 465-473.

Effect of small additions in the form of phosphor pentachloride or phosphor-bearing copper, on grain size and properties. Diagrams, photographs, micrographs, tables. 11 ref. (M27, Al)

45-M. Effects of Pressure on Binary Alloys. III. Five Alloys of Thallium, Including Thallium-Bismuth. IV. Six Alloys of Bismuth. P. W. Bridgman. *American Academy of Arts and Sciences,* v. 84, no. 1, p. 1-109.

Complications in phase diagrams resulting from the presence of the pressure transitions of the main components. Tables, graphs, phase diagram. 22 ref. (M24, Tl, Bi)

46-M. Instrumentation in Crystal Mechanics. A. J. Kennedy. *Instrument Practice,* v. 9, Nov. 1955, p. 1052-1056.

Basic mechanical problem, geometric and profile devices, and the use of an electrical extensometer. Special problems summarized. Diagrams. 11 ref. (M23)

47-M. The Electronic Energy Band Structure of Silicon and Germanium. Frank Herman. *I. R. E., Proceedings,* v. 43, Dec. 1955, p. 1703-1732.

Introduction to the quantum theory of crystals, covering the theory energy of bands in a perfect crystal, structure and relationship between some of the electrical and optical properties. Diagrams, graphs. 71 ref. (M25, P15, P17, Si, Ge)

48-M. The Structure of Lithium-Magnesium Solid Solutions. II. Measurements of Diffuse X-Ray Scattering. F. H. Herbstein and B. L. Averbach. *Massachusetts Institute of Technology, Department of Metallurgy (U. S. Atomic Energy Commission),* NYO-7050, Sept. 1955, 23 p.

A preference for unlike nearest neighbors is indicated by diffuse X-ray scattering data from BCC solutions of lithium-magnesium alloys. Individual atoms are displaced from average lattice sites. The lithium-magnesium interatomic distance is shorter than the average of the distances between like atoms. Graphs. 13 ref. (M26, Li, Mg)

49-M. Metallography of Thorium. R. J. Gray and M. J. Feldman. *Metallurgy Development Advisory Comittee (U. S. Atomic Energy Commission),* TID-5117, Feb. 1952, 27 p.

A compilation of notes from the Fifth Metallographic Conference, Westinghouse Atomic Power Division, on the preparation of a series of thorium samples. Micrographs, tables. (M21, Th)

50-M. The Lattice Spacings of Solid Solutions of Titanium, Vanadium, Chromium, Manganese, Cobalt and Nickel in Alpha-Iron. A. L. Sutton and W. Hume-Rothery. *Philosophical Magazine,* v. 46, 7th ser., no. 383, Dec. 1955, p. 1295-1309.

Measurements of the lattice spacings in alpha-iron, formed by the elements from titanium to nickel, are compared with solid solutions in ruthenium formed by the corresponding elements in the Second Long Period and with those obtained for solid solutions in nickel. Tables, graphs. 17 ref. (M26, Ti, V, Cr, Mn, Co, Ni, Fe)

51-M. Surface Distributions of Dislocations in Metals. C. J. Ball and P. B. Hirsch. *Philosophical Magazine,* v. 46, 7th ser., no. 383, Dec 1955, p. 1343-1352.

Experimental data on the nature of dislocation boundaries in deformed crystals. Tables, diagrams. 17 ref. (M26)

52-M. Effects of Defects on Lattice Vibrations. Elliott W. Montroll and Renfrey B. Potts. *Physical Review,* v. 100, ser. 2, Oct. 15, 1955, p. 525-543.

Theory of the effect of localized defects, such as impurities, holes and interstitials, on the vibrations of crystal lattices. Although most of the analysis is concerned with one-dimensional chains, the general approach to defects in three-dimensional lattices is outlined through the example of a simple cubic lattice with nearest-neighbor interactions. Diagrams, graphs. 12 ref. (M26)

53-M. The Crystal Chemistry of Non-Stoichiometric Compounds. A. D. Wadsley. *Reviews of Pure and Applied Chemistry,* v. 5, Sept. 1955, p. 165-193.

Examines structural changes accompanying departures from ideal composition, and discusses ordering of defects, crystalline solids, substitutional and interstitial systems, and tunnnel and layer-compounds. Diagrams, tables. 184 ref. (M26)

54-M. Some Modifications and Techniques Applied to the RCA Type EMU Electron Microscope. F. W. Bishop. *University of California, Los Angeles Campus, School of Medicine (U. S. Atomic Energy Commission),* UCLA-354, Nov. 1955, 33 p.

Compilation of unpublished information on small modifications or improvements in the electron microscope which have been made within the last 5 or 6 yr. Diagrams, micrographs, photograph. (M21)

55-M. (French.) Appearance of Surface Microstructures in Iron-Chromium Alloys Subjected to a Selective Oxidation Reaction. Jean Moreau and Jacques Bénard. *Comptes rendus,* v. 241, no. 22, Nov. 28, 1955, p. 1571-1573.

Analysis of the mechanism of selective oxidation of chromium and iron-chromium alloys in the presence of hydrogen and water vapor mixtures. Micrographs. 7 ref. (M27, R2, Fe, Cr)

56-M. (French.) Role of the Porosity of Cast Steel in the Segregation of Hydrogen. Jean Drain and Paul Bastien. *Comptes rendus,* v. 241, no. 22, Nov. 28, 1955, p. 1573-1575.

Study of relationship between hydrogen content and porosity in steel ingots. Diagrams. 3 ref. (M28, D9, CI)

57-M. (French.) New Sodium Bisulfite Micrographic Reagent for Steels. L. Beaujard and J. Tordeux. *Revue de métallurgie,* v. 52, no. 9, Sept. 1955, p. 750-756.

Process reveals physical, chemical and structural characteristics in an improved fashion. Micrographs, photograph, graph. 7 ref. (M21, ST)

58-M. (German.) Investigation of a Binary Metallic System by the Amalgam Method. System Nickel-Tin. F. Lihl and H. Kirnbauer. *Monatshefte für Chemie,* v. 86, no. 5, Oct. 1955, p. 745-751.

Nickel-tin system shows only one phase at compositions up to 50 at. % tin. At higher tin contents several phases are present. Table, diffractograms, diagrams. 17 ref. (M24, Hg, Ni, Sn)

59-M. (German.) Formation of Type M_5Si_3 Silicides. E. Parthé, B. Lux and H. Nowotny. *Monatshefte für Chemie,* v. 86, no. 5, Oct. 1955, p. 859-867.

Determination of the second modification of Cb_5Si_3 and Ta_5Si_3 whose phases crystallize in the same manner as Cr_5B_3. Reviews other silicides with 33 to 45 at. % silicon. Tables, diagrams. 21 ref. (M26, Cb, Ta, Si)

60-M. (German.) Uniform Statistical Treatment of the Problem of Valence-Electrons in Metals. W. R. Theis. *Zeitschrift für Physik,* v. 142, no. 5, 1955, p. 511-517.

By utilizing statistical treatment of valence and inner electrons the known pressure-density relation of aluminum is extended to the zero-pressure point. This process can be applied to all metals where the smallest electron density is several times greater than that of the alkali metals. Graph. 14 ref. (M25)

61-M. (Norwegian.) Structure and Properties of Electrolytically Deposited Metals. Frithjof Dyngvold. *Teknisk ukeblad,* v. 102, no. 42, Nov. 17, 1955, p. 913-918.

Reviews new data reported at the metallurgical meeting of 1955 at the University of Birmingham on adhesion and mechanical properties of electrodeposits. Tables. 3 ref. (M27, L17)

62-M. (Russian.) Certain Phenomena Observed in the Electron Microscope on a Tungsten Mono-Crystal Surface in the Presence of Gases. S. Z. Roginskii and I. I. Tret'iakov. *Doklady akedemii nauk SSSR,* v. 105, no.1, Nov. 1, 1955, p. 112-114.

Study of adsorbed molecules on tungsten single crystals under a vacuum. Diagram, micrographs. 4 ref. (M26, W)

63-M. Simple Adaptation of the Carbon Replica Technique for the Examination of Selected Areas in the Electron Microscope. D. E. Bradley. *British Journal of Applied Physics,* v. 6, Dec. 1955, p. 430-432.

Includes micrographs, diagrams. 7 ref. (M21)

64-M. Siliceous Inclusions. R. E. Lismer and F. B. Pickering. *Iron & Steel,* v. 28, Nov. 30, 1955, p. 589-591; disc., p. 631-633.

X-ray analysis of residues from several ingots deoxidized by silicon. Tables, micrographs. (M22, Fe)

65-M. Titaniferous Inclusions. F. B. Pickering. *Iron & Steel,* v. 28, Nov. 30, 1955, p. 591-593; disc., p. 631-633.

A microscopical examination of iron samples under normal vertical illumination and polarized light; crystalline constituents of ingot residues determined by X-ray analysis of alcoholic iodine residues. Micrographs, table. (M27, M22, Ti)

66-M. Metallography of Delta-Ferrite. I. Eutectoid Decomposition. II. Formation of Delta-Eutectoid in 18-4-1 Type High-Speed Steels. III. Isothermal Transformation of Delta-Ferrite in a Low-Carbon 27-5-1.5 Cr-Ni-

Mo Steel. IV. Decomposition of Delta-Ferrite Between 650 and 1000° C. in a Low-Carbon 18-10-3 Cr-Ni-Mo Steel. V. Delta-Eutectoid and the Constitution Diagram of the Fe-M-C System. Kehsin Kuo. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 593-620; disc., p. 633-635, 640.

Includes micrographs, graphs, tables, diagrams. (M21, N8, Fe)

67-M. Nondestructive Grain Size Measurements With Ultrasonics. D. L. Worlton. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 24-26.

Degree to which ultrasonic energy is absorbed in traveling through brass related to the wave length associated with the ultrasonic waves and average grain diameter of the metal. A curve obtained establishes this relationship for cylindrical samples and suggests a means of quantitative measurement of diameters. Micrographs, graphs, photographs, diagram. (M23, M27, Cu)

68-M. Metallurgical Application of Wet-Process Autoradiography. George C. Towe, Henry J. Gomberg and J. W. Freeman. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 36-39.

Methods of preparing metal specimens for autoradiographic examination, results obtained. Micrographs, diagram, table. 3 ref. (M23, ST, Ni)

69-M. X-Ray Intensity Measurements With Counter Tubes. W. Parrish. *Philips Technical Review*, v. 17, Jan.-Feb. 1956, p. 206-221.

Various problems involved in quantitative radiation intensity measurement with counter tubes. Diagrams, graphs, photographs, tables. 16 ref. (M22)

70-M. The Binding Energy of Nitrogen in a Dislocation. W. R. Thomas and G. M. Leak. *Physical Society, Proceedings*, v. 68, no. 432B, Dec. 1955, p. 1001-1007.

Equilibrium considered between nitrogen atoms in free solution and nitrogen atoms bound in dislocation sites. Value for the binding energy of nitrogen atoms in dislocation sites estimated as lying between 0.75 and 0.8 e.v. per nitrogen atom. Graphs, table. 12 ref. (M26, Fe, N)

71-M. Magnetic Domain Structure in Twinned Crystals of Silicon Iron. R. Street and E. O. Hall. *Physical Society, Proceedings*, v. 68 no. 432B, Dec. 1955, p. 1033-1037.

Examination, by colliod deposition techniques, of influence on domain structure caused by presence of twin bands. Diagram, graph. 8 ref. (M26, P16, Fe)

72-M. Modification of the Peierls-Nabarro Model for Edge Dislocation Core. H. B. Huntington. *Physical Society, Proceedings*, v. 68, no. 432B, Dec. 1955, p. 1043-1048.

Critical review of various assumptions implicit in the Peierls-Nabarro treatment of the core of an edge dislocation. 5 ref. (M26)

73-M. An Optically Focusing X-Ray Diffraction Camera. A. Franks. *Physical Society, Proceedings*, v. 68, no. 432B, Dec. 1955, p. 1054-1064.

To obtain low-angle diffraction photographs the focusing is accomplished by total external reflection either by one elastically bent optical flat to form a line focus, or by two crossed flats to form a point focus. The beam is partially monochromatized and its intensity is high. Diagrams, graphs. 22 ref. (M22)

74-M. The Structure of Cold Worked Gold. I. A Study by Electron Diffraction. P. B. Hirsch, A. Kelly and J. W. Menter. *Physical Society, Proceedings*, v. 68, no. 432B, Dec. 1955, p. 1132-1145.

Experimental results show that it is possible to obtain information about the structure from a detailed study of the number, shape and arrangement of spots on the transmission electron diffraction pattern from a thin foil. Diagrams, tables. 23 ref. (M21, M27, Au)

75-M. Nondestructive Determination of Grain Size in Metals. Nicholas Grossman. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission)*, SEP-184, Aug. 1955, 31 p.

Ultrasonic methods explored were through transmission and pulse technique, amplitude decay, back reflections counting. Results obtained on brass, steel and zirconium. Micrographs, diagrams, graphs, photographs, tables. 15 ref. (M27, Cu, ST, Zr)

76-M. Physical Metallurgy. A. R. Bailey. Paper from "Reports on the Progress of Applied Chemistry". v. XXXIX. Society of Chemical Industry, p. 85-104.

Metallographic techniques, deterioration of metal under stress, solidification process in metals, crystallization and structure of cast iron, solid-state transformations. 216 ref. (M general, N general, Fe, Zn)

77-M. (English.) The Crystal Structure of Mo_5Si_3 and W_5Si_3. Bertil Aronsson. *Acta Chemica Scandinavica*, v. 9, no. 7, 1955, p. 1107-1110.

Structure of W_5Si_3 determined using single crystal data. The relations between the W_5Si_3-structure and the $D8_8$- and Fe_2P-structures discussed. Diagrams, table. 11 ref. (M26, W, Mo)

78-M. (English.) Theory of the Formation of Lattice Defects During Plastic Strain. G. H. Van Bueren. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 519-524.

Theory to show relation between plastic strain and concentration of vacancies, dislocations and interstitials; studies behavior of dislocation sources under a varying applied shear stress. Compares theoretical deductions and the strain dependence of the electrical resistivity of copper. 14 ref. (M26, Q24, Cu)

79-M. (English.) Interaction Between Dislocations and Interstitial Atoms in Body-Centered Cubic Metals. A. W. Cochardt, G. Schoek and H. Wiedersich. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 533-537.

Theory of Cottrell and Bilby on the locking of dislocations extended. It was found that carbon atoms near an edge dislocation are spread out over all angles below the slip plane and are concentrated in a neighborhood of the slip plane rather than at positions just below the dislocation. Diagrams, graphs. 16 ref. (M26, Fe)

80-M. (English.) A Surface Structure Observed on Electrolytically Polished Zinc. K. F. Hulme. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 572-578.

Results indicate that the structure is not a revelation of an internal substructure or "mosaic" of the metal but is closely associated with the electropolishing process. Diagrams, graphs, micrographs, table. 22 ref. (M27, L13, Zn)

81-M. (English.) The Quadrupole Moment of La^{139}. Kiyoshi Murakawa. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 927-929.

Hyperfine structure of the spectra of lanthanum (I) and lanthanum (II) was studied, and the data, together with an improved value of the screening correction of the *d*-electron, yielded the result that the quadrupole moment of lanthanum (139) is $(0.6 \pm 0.2) \times 10^{-24}$ sq. cm. Tables. 11 ref. (M25, La)

82-M. (English.) Some Observations on Dislocations in Copper Crystals. Hideji Suzuki. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 981-995.

Well-developed octahedral and cubic faces have been obtained in recrystallized copper by annealing the material at a temperature close to the melting point. Micrographs, diagrams. 8 ref. (M26, J23, Cu)

83-M. (English.) Observations of Dislocations Along Grain Boundaries in Germanium Crystals. Jun'ichi Okada. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 1018-1019.

Study of the dislocations, by means of the etching process, gave results which verify the properties of dislocations along the small-angle-of-misfit grain boundaries. Micrographs. 2 ref. (M26, Ge)

84-M. (English.) On the Solution-Body Phenomenon and Anisotropy of Solution Rate in Zinc Crystal. Mikio Yamamoto and Jiro Watanabé. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 7, no. 3, June 1955, p. 262-268.

Solution rate of zinc crystal in nitric acid was found to be isotropic. Circular rod crystals etched with concentrated and dilute hydrochloric acids formed solution bodies characteristics of their orientations. Table, diagrams, graph, photographs. 8 ref. (M26, Zn)

N

Transformations and Resulting Structures

40-N. Continuous-Cooling Transformation Characteristics Related to Weldability of a 0.5% C Steel. B. J. Bradstreet and R. L. Wilkins. *British Welding Journal*, v. 2, Dec. 1955, p. 562-566.

Studies by a direct-recording method, using a strain-gage dilatometer to operate a "function plotter", modified to draw simultaneous dilatation-temperature and time-temperature curves for a small steel specimen. Diagrams, tables, graphs, micrographs. 7 ref. (N8, K9, CN)

41-N. Precipitation of Copper in Germanium. R. A. Logan. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 615-617.

When copper-doped germanium is cooled from a high temperature in regions of high dislocation density, significant precipitation occurs in a cooling cycle of only a few seconds. In order to prevent precipitation the sample must be quenched in a time of the order of 0.1 sec. Graphs. 11 ref. (N7, Ge, Cu)

42-N. (English.) Dendrites and Growth Layers in the Electrocrystallization of Metals. Gösta Wranglen. *Kungl. Tekniska Högskolans Handlingar (Transactions of the Royal Institute of Technology, Stockholm, Sweden), 1955*, no. 94, 42 p. + 13 plates.

A microscopic and microphotographic study. Diagrams, tables, photographs, micrographs. 47 ref. (N12)

43-N. (German.) Structural Change of Germanium Vapor Deposited Layers Under the Electron Microscope. E. W. Fischer and H. Richter. *Annalen der Physik*, v. 16, nos. 5-8, 1955, p. 193-209.

Germanium layers can undergo the following structural changes

under the influence of electrons: transformation from amorphous to fine crystals, gathering crystallization, twinning, and crystallization from vapor phase. Diagrams, micrographs. 23 ref. (N15, Ge)

44-N. (German.) Grain Formation and Change in Properties of High-Copper-Content Copper-Silicon and Copper-Manganese-Silicon Alloys. M. Nony and K. L. Dreyer. *Metall*, v. 9, nos. 21-22, Nov. 1955, p. 947-954.

Discovery of a new phase in copper-silicon alloys. Change in electrical resistance and hardness in connection with structural transformation at different temperatures. Graphs, micrographs. 13 ref. (N3, P15, Q29, Cu)

45-N. (German.) Lattice Transformation of Irreversible Iron-Nickel Alloys. Klaus Stierstadt. *Zeitschrift für Metallkunde*, v. 46, no. 10, Oct. 1955, p. 751-755.

Study of alloys with a 3 to 25% nickel content using a high-frequency method. Relates temperature influence of transformation process, with ferromagnetic phenomena. Graphs, 10 ref. (N6, Fe, Ni)

46-N. (German.) Regularity of Intergrowth Process in Crystals. I. Time-Temperature Law and Energy-Value. Friedrich Erdmann-Jesnitzer and Martin May. *Zeitschrift für Metallkunde*, v. 46, no. 10, Oct. 1955, p. 756-764.

Cohesion of polycrystalline copper plane surfaces, temperature and time conditions, observation of cold pressure welding, lattice condition, state of energy. Table, graphs, diagram, micrographs. 11 ref. (N5, Cu)

47-N. The Effect of Alloying Elements on the Solubility of Nitrogen in Iron. II. The Solubility of Nitrogen in Alpha-Iron Containing up to 0.051% Vanadium. E. T. Turkdogan, S. Ignatowicz and J. Pearson. *Iron and Steel Institute, Journal*, v. 181, Nov. 1955, p. 227-231.

Solubility of nitrogen in alpha-iron, containing 0.016% and 0.051% vanadium, was investigated by equilibrating the alloys with ammonia-hydrogen mixtures at 500 and 600° C. The results indicate that amounts up to 0.051% vandaium have no influence on the solubility. Tables, graphs. 22 ref. (N12, Fe)

48-N. The Effects of Sulfur, Selenium, and Tellurium on Graphite Formation in an Fe-C-Si Alloy. S. Garber. *Iron and Steel Institute, Journal*, v. 181, Dec. 1955, p. 291-302 + 6 plates.

Effects of melting temperature and cooling rate on graphite formation have been determined on alloys of hypo-eutectic and eutectic composition. Changes of graphite morphology induced in the alloy by sulphur or selenium additions result from modifications in the nucleation of the graphite and from the growth rate of the eutectic austenite. Tables, graphs, diagram, micrographs. 25 ref. (N8, S, Se, Te)

49-N. The Isothermal Transformation Characteristics of Carburized 2% Nickel-Molybdenum Steel. G. Mayer and R. H. Hickley. *Metallurgia*, v. 52, no. 313, Nov. 1955, p. 236-239.

Isothermal-transformation diagrams of steels representing the core and four positions for a carburized 2% nickel-molybdenum steel were determined. The mechanical properties of steels of typical core composition are included. Graphs, tables. 11 ref. (N8, Q23, AY)

50-N. (French.) Solubility Differences of Atomic and Molecular Hydrogen in Columbium. Vladimir M. Vukanovic, Vukica M. Milutinovic and Stjepan S. Malcic. *Comptes rendus*, v. 241, no. 19, Nov. 7, 1955, p. 1298-1299.

By X-ray diffraction it is shown that atomic hydrogen solubility is higher than that of hydrogen in the molecular state. (N15, Cb)

51-N. (French.) Gravimetric Study of the Influence of Impurities on the Rate of Diffusion in Alpha-Brasses. André Accary. *Comptes rendus*, v. 241, no. 19, Nov. 7, 1955, p. 1301-1304.

Determination of the influence of antimony, arsenic, phosphorus, silicon and aluminum content on the rate of diffusion by the zinc evaporation method. Graphs. (N1, Cu)

52-N. (French.) Influence of Traces of Impurities on Polygonization of Aluminum. Jean Montuelle. *Comptes rendus*, v. 241, no. 19, Nov. 7, 1955, p. 1304-1306.

Determination of influence of traces of impurities, in the form of sodium, lithium, iron and manganese on aluminum recrystallization when heat treated at 630° C. Micrographs, table. 2 ref. (N5, Al)

53-N. (French.) The Solid Solubility of Sulphur in Iron and Ferromanganese Alloys. E. T. Turkdogan, S. Ignatowicz, and J. Pearson. *Revue de métallurgie*, v. 52, no. 9, Sept. 1955, p. 725-730.

Solid solubility of sulphur in the gamma iron was determined as 0.013 and 0.031% at 1000 and 1200° C., respectively; with a 0.40 and 1.16% manganese content, the sulphur solubility is 0.0019 and 0.0007%, respectively, at 1200° C. Diagram, graphs. 7 ref. (N12, Fe, Mn, S)

54-N. (German.) Growth of Layers During Reaction of Solid Iron With Aluminum and Aluminum-Alloy Melts. Gustav Gürtler and Konrad Sagel. *Zeitschrift für Metallkunde*, v. 46, no. 10, Oct. 1955, p. 738-741.

Relationship between alloys, immersion temperature and formation of Al_5Fe_2 and Al_3Fe layers in respect to practical application. Tables, photographs, micrographs. 7 ref. (N12, Al)

55-N. (German.) Single Crystals With Clean Surfaces. E. Menzel, W. Stössel and M. Otter. *Zeitschrift für Physik*, v. 142, no. 3, 1955, p. 241-244.

Method for preparing high-quality spherical metal crystals, in high vacuum, by solidification on horizontal holders. Surface impurities are moved in front of the phase boundary, there producing a clean surface for further investigation. Photographs. 8 ref. (N12, Cu)

56-N. (Russian.) Properties of Metallic Solutions. V. Influence of Zinc, Aluminum, Cadmium, Manganese, and Bismuth on Properties of Liquid and Solid Tin. N. L. Pokrovskii and M. Saidov. *Zhurnal fizicheskoi khimii*, v. 29, no. 9, Sept. 1955, p. 1601-1609 + 1 plate.

Effect of alloying additions on the beta-alpha transformation in tin. Tables, graphs, diagrams, micrographs. 25 ref. (N6, Sn)

57-N. (Slovenian.) Dislocation of Crystal Boundaries in Secondary Recrystallization. Matija Zumer and Franc Sirca. *Rudarsko-metalurski zbornik*, 1955, no. 3, p. 173-178.

Study of ferrite grain changes in recrystallization at 1050 to 1100° C. Two possible mechanisms of the process. 4 ref. (N5, M27, ST)

58-N. Crystal Growth and Lattice Imperfections. C. Elbaum. *Canadian Metals*, v. 18, Dec. 1955, p. 36-38, 40.

Theoretical studies on growth of crystals from solutions and vapors, growth on dislocations and solidifications from the melt. Diagrams, micrographs. (N12, M26)

59-N. Solubility of Nitrogen in Alpha-Iron. J. D. Fast and M. B. Verrijp. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 574-577; disc., p. 625-628.

Results of an investigation in which both the relation between quantity of dissolved nitrogen and internal friction and the solubilities of nitrogen in alpha-iron in equilibrium with N_2, Fe_4N, and "Fe_8N" were determined. Graphs, table. (N15, Fe)

60-N. Effect of Alloying Elements on Solubility of Nitrogen in Iron. I. The Solubility of Nitrogen in Pure Iron and in 2.83% Silicon Iron. II. The Solubility of Nitrogen in Alpha-Iron Containing up to 0.051% V. N. S. Corney, E. T. Turkdogan, S. Ignatowicz and J. Pearson. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 577-582.

Determines free energies of solutions of nitrogen in solid iron; silicon reduces the solubility in α-iron and increases the activity coefficient of dissolved nitrogen. Investigates the influence of small percentages of vanadium in steel on the formation of nitrides at low-nitrogen potentials and consequently in lowering the solubility of nitrogen in iron. Diagrams, graphs, tables. (N15, Si, Fe)

61-N. Strain Aging of Alpha-Iron. W. R. Thomas and G. M. Leak. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 583-586; disc., p. 628-631.

Precise data on rates of strain aging on specimens that contained only nitrogen and those with carbon only. Graphs, table. (N7, Fe)

62-N. Strain-Aging of Pure Iron. B. Jones and R. A. Owen-Barnett. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 587-589; disc., p. 628-631.

Effect of preliminary temper-rolling and tensile-stressing. Graphs, tables. (N7, Q24, Fe)

63-N. Metallography of Delta-Ferrite. IV. Decomposition of Delta-Ferrite Between 650° and 1000° C. in a Low-Carbon 18/10/3 Cr-Ni-Mo Corrosion-Resisting Steel. V. δ-Eutectoid and the Constitution Diagram of the Fe-*M*-C System. Kehsin Kuo. *Iron and Steel Institute, Journal*, v. 181, Nov. 1955, p. 213-227 + 7 plates.

In the corrosion-resisting steel the ferrite decomposed into acicular austenite, sometimes containing carbide particles. Transformations were related to the various Fe-M-C phase diagrams. (N8, M24, SS)

64-N. Recrystallization in Metals as a Recovery-Nucleated Process. A. J. Kennedy. *Metallurgia*, v. 52, no. 314, Dec. 1955, p. 265-269.

Developments in ideas concerning origin and characteristics of recrystallization nuclei. Graphs. 33 ref. (N4, N5)

65-N. Aging Processes in Plain Carbon Steels and the Effect of Cyclic Stressing on Them. H. Schenck and E. Schmidtmann. *Henry Brutcher Translation No.* 3579, 12 p. (Part from *Archiv Eisenhüttenwesen*, v. 25, nos. 11-12, 1954, p. 583-588.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 107-N, 1955. (N1, N7, CN)

66-N. (English.) The Influence of Thin Intermediate Layers on Interdiffusion in Copper-Nickel Couples. M. L. Mehta and H. J. Axon. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 538-541.

Effect of thin electrodeposited layers of gold, tin, zinc and cadmium on the interdiffusion between fully annealed nickel rod and electrodeposited copper. Graphs. 8 ref. (N1, L17, Cu, Ni)

67-N. (English.) Kinetics of Order-Disorder Transformations. G. J. Dienes. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 549-557.

A simple theory, based on chemical rate theory, which is construct-

ed entirely in terms of the long-range order parameter and reduces to the Bragg and Williams theory at equilibrium. Graphs, tables. 15 ref. (N10)

68-N. (English.) **The Diffusivity of Hydrogen In Nickel.** M. L. Hill and E. W. Johnson. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 566-571.

Hydrogen diffusion determined at 380 to 1000° C. from nonsteady rates of hydrogen evolution. Diagram, graphs, tables. 21 ref. (N1, Ni)

69-N. (English.) **An X-Ray Examination of Crystallographic Transformations in Indium-Rich Solid Solutions with Thallium, Lithium and Lead.** A. Moore, J. Graham, G. K. Williamson and G. V. Raynor. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 579-589.

Includes graphs, micrographs, tables. 19 ref. (N6, T1, Li, Pb)

70-N. (English.) **Crystallographic Relationships in Aged Copper-Beryllium Alloys.** J. S. Bowles and W. J. McG. Tegart. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 590-597.

Geometrical features of the precipitation of CuBe described consistently by the phenomenological theory developed for martensitic transformations. Diagrams, micrographs, tables. 24 ref. (N7, N9, Cu)

71-N. (English.) **Diffusion of Silver in Silver-Zinc and Silver-Cadmium Alloys.** Tokutaro Hirone, Motoharu Kimura, Toshio Kitagaki, Nobuhiko Kunitomi and Yosimitsu Sugita. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 967-970.

Diffusivity of silver (110) in alloys containing about 30% zinc or cadmium measured by means of surface counting. Results show that the silver atoms diffuse most rapidly in the lattice of silver-zinc and that the diffusivity of silver in silver-cadmium is still higher than that in silver itself. Graphs. 7 ref. (N1, Ag, Zn, Cd)

72-N. (English.) **Aging Process in Quenched Aluminum-Zinc Solid Solutions.** Ken-ichi Hirano. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 995-1002.

Investigates relation between the low and high-temperature aging. Graphs. 17 ref. (N7, Al, Zn)

73-N. (English.) **On the Magnetic Ageing of Pure Iron. II.** Mitsuru Asanuma and Sinji Ogawa. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 1025-1026.

Wire of commercial pure iron purified by annealing in a wet hydrogen atmosphere, 0.0065 wt.% nitrogen was dissolved into the specimen and the aging was investigated by the measurement of internal friction at 140° C. Graphs. 6 ref. (N7, Fe)

74-N. (English.) **Formation of Superlattice in Face-Centered Cubic Lattice With a Special Reference to the Copper-Platinum System.** Tokutaro Hirone and Kengo Adachi. *Science Reports of the Research Institutes, Tohoku University*, ser. A, v. 7, no. 3, June 1955, p. 282-293.

Many types of superlattices appeared in the alloys of the system according to relative concentration changes of the component metals. This phenomenon was attributed to the second neighbor interaction and to change of this value accompanied by an increase of *s*-electrons due to the addition of copper. Diagram, graphs, tables. 11 ref. (N10, Cu, Pt)

75-N. (German.) **The Shape of Particles During Precipitation of Carbide in Alpha-Iron.** W. Pitsch. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 542-548.

Combines two experimental methods of internal friction and electrical resistivity to yield a parameter solely dependent on particle shape. Values of the deduced parameter indicate that the precipitated particles are plate-like. Diagrams, graphs, table. 16 ref. (N7, Fe)

76-N. (Japanese.) **Thermodynamic Investigation of Nonmetallic Inclusions in Steel. I. Behavior of Aluminum, Silicon and Iron-Nitrides and Their Effect on Austenitic Grain Size of Steel.** Hiroshi Sawamura and Toshisada Mori. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1082-1090.

Both aluminum and silicon nitrides are estimated to be effective as grain-growth inhibitors, although the latter may be less effective than the former. Some considerations are given about nonmetallic inclusions which act as grain-growth inhibitors. Diagrams, tables, graphs. (N3, P12, ST)

77-N. (Japanese.) **Investigation of Boron Steel. II.** Sadao Koshiba, Kazuo Tanaka and Asao Inata. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1108-1112.

Effects of 0.003 and 0.006% boron on the transformation, hardenability, quenched and tempered hardness, mechanical properties of manganese-chromium and manganese-chromium-molybdenum high-tensile steels. Table, graphs, micrographs. 1 ref. (N8, J26, Q general, AY)

P
Physical Properties and Test Methods

34-P. Superconductivity of Zirconium Alloys. B. T. Matthias and E. Corenzwit. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 626-627.

Superconducting transition temperatures of alloys between zirconium and VIIIth column elements are substantially higher than those of zirconium. The same is true for zirconium-gold alloys. Graphs, table. 2 ref. (P15, Zr)

35-P. Faraday Effect in Germanium at Room Temperature. Richard R. Rau and M. E. Caspari. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 632-639.

Room-temperature measurements of the angle of rotation of elliptically polarized radiation, at microwave frequencies on both *n*- and *p*-type samples of germanium, gave values of 3780 sq. cm. per volt-sec. and 3300 sq. cm. per volt-sec. for the electron and hole mobilities, respectively. Tables, diagrams. 22 ref. (P15, P16, Ge)

36-P. Search for the Hall Effect in a Superconductor. II. Theory. H. W. Lewis. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 641-645.

Various theoretical explanations for the absence of a Hall effect in a superconductor are considered, but none are found convincing. It is concluded that this property lies outside the existing body of theory, and the general requirements it imposes on a future theory are adduced. 9 ref. (P15)

37-P. Relative Absorption of 10 Mc. per sec. Longitudinal Sound Waves in a Superconducting Polycrystalline Tin Rod. L. Mackinnon. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 655-659.

Relative absorption of 10 Mc. per sec. sound pulses studied between 1.5 and 3.73° K. (the transition temperature) in superconducting polycrystalline tin and above 3.73 to 4.2° K. in the normal metal. Diagrams, photographs, graphs. 14 ref. (P10, Sn)

38-P. Properties of Germanium Doped With Manganese. H. H. Woodbury and W. W. Tyler. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 659-662.

Temperature dependence of the electrical resistivity and Hall coefficient in *p*- and *n*-type manganese-doped germanium crystals indicates that manganese introduces two acceptor levels in germanium. Graphs. 8 ref. (P15, Ge)

39-P. Electrical and Optical Properties of Intermetallic Compounds. IV. Magnesium Stannide. R. F. Blunt, H. P. R. Frederikse and W. R. Hosler. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 663-666.

Determinations of conductivity, Hall effect, optical absorption, photoconductivity. Graphs, table. 16 ref. (P15, P17, Mg, Sn)

40-P. Effect of Point Imperfections on the Electrical Properties of Copper. II. Thermoelectric Power. F. J. Blatt. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 666-670.

The changes in the thermoelectric power of copper due to the presence of interstitials and vacancies were calculated in the free electron approximation. It was found that the changes for concentrations of defects encountered in experiments on radiation damage due to massive charged particles are, at liquid nitrogen temperature, of the same magnitude as the absolute thermo-electric power of pure copper. Graphs. 18 ref. (P15, Cu)

41-P. Magnetic Domains in Thin Films of Nickel-Iron. Charles A. Fowler, Jr., and Edward M. Fryer. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 746-747.

By employing the longitudinal Kerr magneto-optic method of domain observation, photographs were made of the domain structure of an evaporated nickel-iron film (80% nickel) 5000 A. thick, measuring 1-in. × 1¼ in. on the surface. Photographs. 8 ref. (P16, Ni, Fe)

42-P. Ultrasonic Attenuation in Superconducting and Normal-Conducting Tin at Low Temperatures. H. E. Bömmel. *Physical Review*, v. 100, ser. 2, Oct. 15, 1955, p. 758-759.

Measurements carried out in single crystals of tin of two different purities at 2 to 19° K. and in magnetic fields of various strengths. Graphs. 6 ref. (P10, P16, Sn)

43-P. Ferromagnetic Domains in Permanent Magnet Materials. L. F. Bates. *Research*, v. 8, Dec. 1955, p. 462-472.

An account of the domain concept and its application to ferromagnetic metals. Special attention given to powder patterns observed on surfaces of Alnico and columnar Alcomax. Diagrams, photographs, micrographs. 3 ref. (P16, SG-n)

44-P. Miscellaneous Effects of Pressure on Miscellaneous Substances. P. W. Bridgman. *American Academy of Arts and Sciences*, v. 84, no. 1, p. 111-129.

Electrical resistance, compression, shearing strength, tensile properties and permanent density change of various materials. Tables, photograph. 17 ref. (P15, Q28, Q23, P10, Y, Re, Tc, Sr, Cr, Ge, Pb)

45-P. Photoconduction in Germanium and Silicon. M. L. Schultz and G. A. Morton. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1819-1828.

Intrinsic response of crystals extends through the entire visible spectrum into the near infra-red, but doped, with appropriate foreign atoms and operated at low temperatures, they are effective impurity photoconductors with response extending into the far infra-red. Diagrams, graphs, tables. 58 ref. (P15, P17, Ge, Si)

46-P. Photoeffects in Intermetallic Compounds. H. P. R. Frederikse and R. F. Blunt. *I. R. E., Proceedings,* v. 43, Dec. 1955, p. 1828-1835.

Classification of the compounds according to crystal structure and to position of component elements in the periodic system. Surveys properties of compounds with zinc blende and fluorite lattice. Tables, graphs, diagram. 40 ref. (P17, M26, Zn)

47-P. Photoconductivity of the Sulfide, Selenide, and Telluride of Zinc or Cadmium. R. H. Bube. *I. R. E., Proceedings,* v. 43, Dec. 1955, p. 1836-1850.

Preparation of photoconductors as evaporated, powder or sintered layers, and as single crystals. Investigation of several photoconductivity phenomena clarifying the nature of the photon and electron processes in the photoconductors. Photograph, diagrams, tables, graphs. 118 ref. (P15, P17, Zn, Cd, Se, Te)

48-P. Performance of Photoconductors. Albert Rose. *I. R. E., Proceedings,* v. 43, Dec. 1955, p. 1850-1869.

A phenomenological analysis of the process whereby the conductivity of a material is increased by exposure to radiation. Diagrams, graph. 54 ref. (P15, P17)

49-P. Lead Salt Photoconductors. T. S. Moss. *I. R. E., Proceedings,* v. 43, Dec. 1955, p. 1869-1881.

Manufacture of cells and processing photosensitive layers; response time, sensitivity and spectral distribution of sensitivity of the final detectors; factors determining maximum attainable sensitivity; fundamental semiconducting properties of lead sulfide, telluride and selenide; theory of photo-effects in layers. Diagrams, graphs, tables. 130 ref. (P15, P17, Pb)

50-P. Dynamic Determination of the Compressibility of Metals. Roy W. Goranson, Dennison Bancroft, Blendin L. Burton, Theodore Blechar, Edwin E. Houston, Elisabeth F. Gittings and Stanley A. Landeen. *Journal of Applied Physics,* v. 26, Dec. 1955, p. 1472-1479.

Theory is presented which allows comparison with data obtained by other experimenters, and which yields the relationship between pressure and compression either at constant entropy or constant temperature. Diagrams, tables, graphs. 1 ref. (P10, Al)

51-P. Total Emissivities and Absorptivities of Some Commercial Surfaces at Room and Liquid-Nitrogen Temperatures. F. J. Zimmermann. *Journal of Applied Physics,* v. 26, Dec. 1955, p. 1483-1488.

Determination of design values for the emissivities and absorptivities of surfaces that could be obtained commercially on reasonably large equipment. Diagrams, tables, graphs. (P17)

52-P. Study of Metal-Ceramic Interactions at Elevated Temperatures. F. H. Norton and W. D. Kingery. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission),* NYO-4632, Oct. 1955, 7 p.

An increase of surface tension from 250 dynes per cm. at 1150° C. to 263 dynes per cm. at 1400° C. occurs in liquid germanium dioxide. Pure nickel has a negative temperature coefficient of surface tension. Graphs, table. (P10)

53-P. Broadening of Impurity Levels in Silicon. Melvin Lax and Elias Burstein. *Physical Review,* v. 100, ser. 2, Oct. 15, 1955, p. 592-602.

Sharp absorption lines have been observed in *p*- and *n*-type silicon whose absolute and relative positions lead to their interpretation as optical transitions between bound states of trapped holes of electrons which are approximately hydrogenic in character. Graphs. 13 ref. (P15, Si)

54-P. Plasma Resonance in Crystals: Observations and Theory. G. Dresselhaus, A. F. Kip and C. Kittel. *Physical Review,* v. 100, ser. 2, Oct. 15, 1955, p. 618-625.

Simplified theory of resonance in a magnetic field in semiconductor crystals for carriers having a single isotropic effective mass. Graphs. 15 ref. (P15, P16, In, Sb)

55-P. Effect of Pressure on the Electrical Resistance of Metals at Liquid Helium Temperatures. J. Hatton. *Physical Review,* v. 100, ser. 2, Oct. 15, 1955, p. 681-684.

In order to determine the nature of the electron-lattice interaction, an investigation was made of the influence on the low-temperature electrical conductivity of metals when lattice spacings are changed by pressure. Graphs. 4 ref. (P15, M26)

56-P. On the Theory of Thermal Conductivity of Monovalent Metals. Tadao Kasuya. *Progress of Theoretical Physics,* v. 13, June 1955, p. 561-570.

Mathematical analysis and discussion of theories. Graphs. 8 ref. (P11)

57-P. (English.) **Thermodynamical Theory of Galvanomagnetic and Thermomagnetic Phenomena.** R. Fieschi. *Nuovo cimento (Supplemento),* v. 2, ser. 10, no. 4, Sept. 1955, p. 1168-1170.

Mathematical analysis. 4 ref. (P12, P16)

58-P. (English.) **The Spontaneous Hall Effect in Ferromagnetics.** I. J. Smit. *Physica,* v. 21, no. 11, Nov. 1955, p. 877-887.

Existing theories on the origin of the effect are invalid, and it is shown that the explanation has to be based on the anisotropic scattering, caused by spin-orbit interaction, of the conducting electrons against the imperfections of the lattice. Diagram, graphs, table. 15 ref. (P15, Fe)

59-P. (French.) **Variation of Viscosity of Metallic Wires With Temperature.** Constantin Salceanu. *Comptes rendus,* v. 241, no. 20, Nov. 14, 1955, p. 1384-1386.

Study of the effect of temperature on the viscosity of iron wire, working with a moment of inertia of 970 g. per sq.cm. Table. 4 ref. (P10, Fe)

60-P. (French.) **Viscosity and Internal Friction in Metallic Wires.** Constantin Salceanu. *Comptes rendus,* v. 241, no. 22, Nov. 28, 1955, p. 1554-1555.

Measurement determination in steel and aluminum wires. 3 ref. (P10, Q22, ST, Al)

61-P. (German.) **The Reduced Normal Curve of Ferro-Magnetic Alloys.** Jakob Kranz and Claus Bodewig. *Zeitschrift für Physik,* v. 142, no. 4, 1955, p. 396-400.

Magnetic properties of copper-nickel alloys at various temperatures. Graphs. 7 ref. (P16, Cu, Ni)

62-P. (Russian.) **Effect of Small Addition on Galvanomagnetic Properties of Bismuth.** N. E. Alekseevskii, N. B. Brandt and T. I. Kostina. *Doklady akademii nauk SSSR,* v. 105, no. 1, Nov. 1, 1955, p. 46-49.

Effect of pressure up to 1750 atmospheres on properties of bismuth with various contents of tin and tellurium. Graphs. 8 ref. (P15, P16, Bi)

63-P. (Russian.) **Nature of Electric Conductivity Change in Case of Staggered Deformation of Metal Monocrystals.** V. N. Rozhanskii, Iu. V. Goriunov and O. D. Shchukin. *Doklady akademii nauk SSSR,* v. 105, no. 1, Nov. 1, 1955, p. 80-82.

Study of electric conductivity changes in zinc of 99.99% purity during deformation. Diagram, graph. 4 ref. (P15, Zn)

64-P. (Russian.) **Zero-Charge Potentials of Copper and Chromium.** E. A. Ukshe and A. I. Levin. *Doklady akademii nauk SSSR,* v. 105, no. 1, Nov. 1, 1955, p. 119-122.

Method of measuring potentials by means of bubble position on the electrode. Graphs, photographs. 12 ref. (P15, Cr, Cu)

65-P. (Russian.) **Properties and Structure of Ternary Semiconducting Systems. II. Electrical Properties and Structure of Materials in the System Thallium, Antimony, and Arsenic.** N. A. Goriunova and B. T. Kolomiets. *Zhurnal tekhnicheskoi fiziki,* v. 25, no. 12, Oct. 1955, p. 2069-2078.

Discusses composition as a factor in the determination of structural and property changes. Tables, graphs, diagram. 4 ref. (P15, M24, Th, Sb, As)

66-P. (Russian.) **Certain Peculiarities of Temperature Dependence of Density and Electroconductivity of the Liquid Melts Tellurium-Selenium.** N. P. Mokrovskii and A. R. Regel'. *Zhurnal tekhnicheskoi fiziki,* v. 25, no. 12, Oct. 1955, p. 2093-2096.

Data in experimental investigation of temperature dependence presented in tabulated and charted form. Critical analysis of data. Graphs, tables. 14 ref. (P10, P15, Te, Se)

67-P. (Russian.) **Electrical Properties of Zinc Telluride.** B. I. Boltaks, O. A. Matveev and V. R. Savinov. *Zhurnal tekhnicheskoi fiziki,* v. 25, no. 12, Oct. 1955, p. 2097-2103.

Influence of temperature on electroconductivity, thermo-electromotive force, and on concentration and mobility of current carriers. Table, graphs. 11 ref. (P15, Zn, Te)

68-P. Thermal Cycling Equipment. R. M. Mayfield and S. T. Zegler. *Argonne National Laboratory, Metallurgy Division (U. S. Atomic Energy Commission),* ANL-4848, Nov. 1951, 26 p.

Design and construction of an induction cycling unit, a vertical tube unit (Woosher), and a low-temperature unit (Wig Wag), built at Argonne National Laboratory for studying effect of thermal cycling on the dimensional stability of uranium. Photographs, diagrams, graphs, table. (P11, P10, U)

69-P. Technical Properties of Iron Powder Magnets. E. H. Carman. *British Journal of Applied Physics,* v. 6, Dec. 1955, p. 426-429.

Measurements of coercive force, remanence and maximum energy product of iron compacts as functions of density packing and X-ray particle size. Graphs, tables. 9 ref. (P16, H11, Fe)

70-P. Effects of Processing on Magnetic Alloys. Robert H. Trapp. *Electrical Manufacturing,* v. 57, Jan. 1956, p. 110-113.

Variables in processing steps which control the physical and magnetic properties of magnetic alloys. Graph, micrographs. (P16, SG-n, p)

71-P. A General Approach to Hysteresis. IV. An Alternative Formulation of the Domain Model. D. H. Everett. *Faraday Society, Transactions,* v. 51, Nov. 1955, p. 1551-1557.

Compares various approaches to the representation of hysteresis systems in terms of a domain model, provides simple method of expressing equations for scanning curves within a hysteresis loop. Graphs. 8 ref. (P16)

72-P. Thermodynamics of Carbon in Iron Alloys. I. Solubility of Carbon in Fe-P, Fe-Si and Fe-Mn Melts. II. Influence of Silicon on Activity Coefficient of Carbon Dissolved in Molten Iron. III. Solubility of Carbon in Fe-S Melts. IV. Solubility of Carbon in Fe-Si-P Melts. E. T. Turkdogan, L. E. Leake and R. A. Hancock. *Iron & Steel,* v. 28, Nov. 30, 1955, p. 567-574.

Includes tables, diagram, graphs. (P12, Fe)

73-P. The Barkhausen Effect. R. S. Tebble. *Physical Society, Proceedings,* v. 68, no. 432B, Dec. 1955, p. 1017-1032.

Critical examination of the elementary processes usually considered responsible for the discontinuous and irreversible domain boundary movements associated with the Barkhausen effect. Diagrams, graphs. 9 ref. (P16, Fe)

74-P. Some Electrical Effects of the Adsorption of Water Vapour by Anodized Aluminium. A. C. Jason and J. L. Wood. *Physical Society, Proceedings,* v. 68, no. 432B, Dec. 1955, p. 1105-1116.

Resistance and capacity of porous anodized aluminum oxide layers related to adsorption of water on the surface of the pores. Diagrams, graphs, tables. 14 ref. (P13, P15, L19, Al)

75-P. The Thermo-Electric Power of Monovalent Metals. H. Jones. *Physical Society, Proceedings,* v. 68, no. 432A, Dec. 1955, p. 1191-1193.

Thermo-electric power of the noble metals is very sensitive to the form of the Fermi surface and therefore is not necessary to have the conditions usually associated with "hole conduction" to obtain a positive value. Diagrams. 2 ref. (P15, Cu, Ag, Au, Li)

76-P. (English.) The Heats of Formation of Some Transition Metal Silicides. D. A. Robins and I. Jenkins. *Acta Metallurgica,* v. 3, no. 6, Nov. 1955, p. 598-604.

Data show that lower silicides are, in most cases, more stable than the disilicides, and that the highest heats of formation are to be found in Group IVa. Diagram, tables. 13 ref. (P12, Ti, Zr, Th, V, Ta, Mo, W)

77-P. (English.) Residual Magnetization and Magnetostriction of Nickel Single Crystals. Yoji Nakamura. *Physical Society of Japan, Journal,* v. 10, no. 11, Nov. 1955, p. 937-941.

By use of long cylindrical single crystals of pure nickel with various crystallographic orientations, magnetization and magnetostriction were measured at room temperature. Magnetostriction curves constructed theoretically from the obtained values of magnetostriction constants agree with the experimental curves. Diagrams, tables. 12 ref. (P16, Ni)

78-P. (English.) A Theory of the Uniaxial Ferromagnetic Anisotropy Induced by Magnetic Annealing in Cubic Solid Solutions. Satoshi Taniguchi. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 7, no. 3, June 1955, p. 269-281.

A solid solution may yield an anisotropic equilibrium distribution of solute atom pairs at temperatures below the Curie temperature. This may cause an additional ferromagnetic anisotropy having a lower-than-cubic symmetry. Results obtained from calculating uni-axial ferromagnetic anisotropy induced by magnetic annealing agree with available experimental data. Graphs, tables. 21 ref. (P16)

79-P. (German.) Treatment of Light-Alloy E AlMgSi. E. Nachtigall and H. Landerl. *Aluminium Ranshofen, Mitteilungen,* v. 3, no. 2, Oct. 1955, p. 40-43.

Mechanical and physical properties of light wire, soft and liquid annealing, cold and hot age hardening. Graphs.

(P general, Q general, J27, Al)

80-P. (Japanese.) Distribution Equilibrium of Chromium Between Molten Pig Iron and Slag. Toshio Niinomi, Yukio Matsushita and Kuro Kanamori. *Iron & Steel Institute of Japan, Journal,* v. 41, no. 10, Oct. 1955, p. 1075-1081.

Results of study on reduction equilibrium of chromium in the temperature range from 1350 to 1500° C. and the slag basicity CaO/SiO_2 ranging from 0.6 to 1.4 under one atmosphere pressure of carbon monoxide. Graphs, tables, diagram. 13 ref. (P12, D1, Cr,Fe)

81-P. (Russian.) Connection Between the Potential of Zero Charge and Physical-Chemical Characteristics of Metals. V. M. Novakovskii, E. A. Ukshe and A. I. Levin. *Zhurnal fizicheskoi khimii,* v. 24, no. 10, Oct. 1955, p. 1847-1853.

On the basis of contemporary theory of electrode potential, equations are derived which relate the potential of zero charge with other physical-chemical characteristics. Tables. 13 ref. (P15)

Q
Mechanical Properties and Test Methods; Deformation

68-Q. On the Danger of Combined Stresses in Pressurized Structures. M. Zaustin. *Aeronautical Engineering Review,* v. 14, Dec. 1955, p. 45-48.

Failure of the Comets explained in terms of fuselage shell brittleness. Points out the need to replace the tensile theory of the strength of materials with a new criterion. Diagram. (Q25, Q23, Al, ST)

69-Q. Effect of Yielding on the Fatigue Properties of Test Pieces Containing Stress Concentrations. K. Gunn. *Aeronautical Quarterly,* v. 6, Nov. 1955, p. 277-294.

A method of estimating the fatigue properties of notched test pieces when cyclic loads are applied in the presence of mean stresses. Method takes into account the local yielding which occurs near the base of the notch when the nominal stresses are sufficiently high. Graphs, diagrams. 4 ref. (Q7, Q25)

70-Q. Initial Investigation of Niobium and Niobium-Base Alloys. Henry A. Saller, John T. Stacy and Stanley W. Porembka. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1003, May 1955, 40 p.

Factors influencing fabrication characteristics of the arc-melted alloys. Graphs, micrographs, tables, diagrams. 7 ref.

(Q general, F general, Cb)

71-Q. Hydrogen in Mild-Steel Weld Deposits. N. Christensen and R. Rose. *British Welding Journal,* v. 2, Dec. 1955, p. 550-558.

Formation of internal microcracks studied in single-run deposits from 11 brands of Continental electrodes. Preliminary experiments illustrating a new method suggested for study of cracking under controlled cooling rates. Resemblance between fish-eyes and brittle spots due to hydrogen cracks. Diagrams, micrographs, tables. 17 ref. (Q26, K9, ST)

72-Q. (Czech.) Calculation of Strength of Machine Parts Subject to Fatigue Stresses. F. Budinsky and V. Jirasek. *Strojirenstvi,* v. 5, no. 8, Aug. 1955, p. 587-588 + 4 p. suppl.

Two problems which demonstrate the use of the supplementary tables in testing axles and shafts by bending and torsion. Effect of notch sensitivity on fatigue limit. Tables, graphs. (Q7, Q1, Q5, ST, CI)

73-Q. (Czech.) Testing of Ferritic Steels at Low Temperatures. Jar. Kermes. *Strojirenstvi,* v. 5, no. 8, Aug. 1955, p. 598-605.

Effect of low temperatures on the operational reliability of parts subject to dynamic stress and reasons for brittleness resulting at such temperatures. Effect of various factors on critical temperature and of heat treatment and chemical composition. Tables, graphs, micrograph, photograph. 11 ref. (Q23, J general, SS)

74-Q. (German.) Determination of Rigidity and Resilience Properties of Soft Copper Wire. F. Glander. *Metall,* v. 9, nos. 21-22, Nov. 1955, p. 972-978.

Relation between resilience properties and rigidity; direct measurement of resilience; bending tests. Tables, graphs, diagrams, photographs. 8 ref. (Q23, Q5, Cu)

75-Q. (German.) Development and Present State of the Nonmagnetic Steels. Walter Grass. *Stahl und Eisen,* v. 75, no. 23, Nov. 17, 1955, p. 1558-1562.

Surveys the situation with respect to Germany and other countries. Graph, tables. 9 ref. (Q general, ST)

76-Q. (German.) Hardening and Deformability of Copper-Chromium Alloys. Wolfgang Gruhl and Rudolf Fischer. *Zeitschrift für Metallkunde,* v. 46, no. 10, Oct. 1955, p. 742-748.

Measurement of hardness of alloy after cold deformation and aging and deformations during different stages of aging; X-ray and electron microscope investigation and comparison with aluminum alloys. Table, graphs, micrographs, diffractograms. 16 ref. (Q24, Q29, M22, N7, Cu, Cr)

77-Q. (German.) Measurement of Latent Deformation Energy of Drawn Copper Wire. Konrad Bohnenkamp, Kurt Lücke and Georg Masing. *Zeitschrift für Metallkunde,* v. 46, no. 10, Oct. 1955, p. 765-770.

Determination of latent deformation energy by differentiation method and accompanying heat development. Tables, graphs, diagrams. 24 ref. (Q24, F28, Cu)

78-Q. (Japanese.) Strength of Structural Parts of Plate Girders. Yoshiaki Tada and Takayoshi Shiraishi. *Journal of Railway Engineering Research (Japan),* v. 12, nos. 16-17, Sept. 10, 1955, p. 389-433.

Ultimate load-bearing strength of each member of the test girders was calculated and shows that the compressive flange has the least strength, yet it has a safety factor as high as 2.6 to 3.1; the web has

a higher strength; and the strength of stiffeners was excessive. Diagrams, tables, graphs, photographs. 4 ref. (Q23, AY)

79-Q. Quantitative Determination of Rolling and Recrystallization Textures in 600 and 300° C. Rolled Uranium Rods. Warren P. Chernock and Paul A. Beck. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, AECD-3663, Aug. 1951, 38 p.

Rolling textures consist of two fiber texture components in which the (010) and the (110) planes are perpendicular to the rod axis. Recrystallization texture of a rod having a (010) rolling texture consists of the (010) and the (140) fiber texture components. Diagrams, graphs, photographs. 19 ref. (Q24, N5, U)

80-Q. Mechanical and Metallurgical Properties of Thorium. A. D. Schwope, G. T. Muehlenkamp and L. L. Marsh. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-784, Nov. 1952, 29 p.

Thorium is evaluated as a potential material, subject to reactor strength requirements. Tables, graphs. (Q general, Th)

81-Q. Investigation of Wrought Iron-Chromium-Aluminum Alloys Containing Platinum and Palladium. Henry A. Saller, John T. Stacy and Stanley W. Porembka. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1017, July 1955, 20 p.

Addition of up to 20 wt.% platinum and palladium increased oxidation resistance and short-time stress-rupture strength at higher temperatures. Micrographs, graphs, tables. (Q23, R2, Cr, Fe, Al)

82-Q. Causes of Failure in Internal Combustion Engine Valve Springs With Particular Reference to Fatigue. J. H. Darley. *Gas and Oil Power, (Annual Technical Review Number)*, v. 50, 1955, p. 335-338.

Typical causes of defects and the use of coatings and mechanical treatment to overcome failures. Tables. 7 ref. (Q7, St)

83-Q. An Investigation of the Factors Contributing to the Failure of Diesel Engine Pistons and Cylinder Covers. D. Fitzgeorge and J. A. Pope. *Gas and Oil Power, (Annual Technical Review Number)*, v. 50, 1955, p. 350, 352.

Stresses that occur in combustion-chamber parts discussed with regard to their nature, magnitude and likely contribution to failure. Physical and mechanical constants of the material which affect the thermal stresses and modifying influence of plastic deformation. Diagrams. (Q25, Q24)

84-Q. An Investigation of the Bending of Angle Beams in the Plastic Range. H. Norman Abramson, Harry A. Williams and Bruce G. Woolpert. *Journal of the Aeronautical Sciences*, v. 22, Dec. 1955, p. 818-828.

Attempts to determine to what extent a relationship between bending moment at the midspan and outer fiber stress will agree with the applied end moment if a simplified theoretical approach is used in the analysis. Photographs, graphs, tables, diagrams. 17 ref. (Q5, Al)

85-Q. Elastic-Stress Waves Produced by Pressure Loads on a Spherical Shell. J. H. Huth and J. D. Cole. *Journal of Applied Mechanics*, v. 22, Dec. 1955, p. 473-478.

Treats problem of stresses in a spherical elastic shell subjected to a plane pressure wave traveling across it with constant speed, a case of technical interest when considering the effect of blast waves on the structure of a missile in flight. Graphs. 9 ref. (Q25)

86-Q. Plastic Deformations of a Free Ring Under Concentrated Dynamic Loading. R. H. Owens and P. S. Symonds. *Journal of Applied Mechanics*, v. 22, Dec. 1955, p. 523-529.

Attempts to determine the deformations of the ring when the force magnitudes are such that plastic strains, large compared with elastic strains, occur. By neglecting elastic strains and assuming ideally plastic behavior, approximations to the final deformations of the ring are obtained. Graphs, diagrams. 5 ref. (Q24)

87-Q. Creep of High-Purity Nickel. *National Bureau of Standards, Technical News Bulletin*, v. 39, Dec. 1955, p. 162-164.

Precise data on creep in the first two stages. Micrographs, graphs. 2 ref. (Q3, Ni)

88-Q. Effects of Temperature on the Plastic Properties of Aluminum Crystals. A. H. Cottrell and R. J. Stokes. *Royal Society, Proceedings*, v. 233, ser. A, Dec. 6, 1955, p. 17-34 + 2 plates.

By changing the temperature of deformation, during tensile experiments on single crystals, it is possible to separate reversible changes of flow stress with temperature from irreversible ones. It is proposed that, under the combined influence of stress and temperature, sessile dislocations at the heads of piled-up groups of dislocations become unlocked; the piled-up groups then partly collapse and many dislocations are released for slip. The reversible changes of flow stress are interpreted in terms of the intersection of dislocation lines. Tables, graphs, photographs. 30 ref. (Q27, M26, Al)

89-Q. Fatigue of Aircraft. P. L. Teed. *Shell Aviation News*, 1955, no. 208, Oct., p. 14-21.

History of the evolution of aerodynamics. Data on the stresses imposed on an aircraft and effects of built-in stresses. Photograph, diagrams, tables, graphs. (Q7, Al)

90-Q. Failure of Materials Under Combined Repeated Stresses With Superimposed Static Stresses. George Sines. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3495, Nov. 1955, 69 p.

Bi-axial alternating stresses and simple combinations of static stress, with alternating stress, is shown to lead to a general criterion for the effect of static stress on the permissible amplitude of alternating stress. Graphs, diagrams, photographs, tables. 45 ref. (Q25, Q7)

91-Q. Tensile Properties of Zirconium and Zirconium Alloys. I. Zirconium and Alloys With Oxygen, Columbium, Tin, Copper, Vanadium, Tungsten, and Tantalum. C. R. Simcoe and W. L. Mudge, Jr. *Westinghouse Electric Corporation (U. S. Atomic Energy Commission)*, AECD 3680, Nov. 1951, 70 p.

Tensile properties of rolled and annealed sheets, in the range from room temperature to 750° F., were determined as a function of temperature. Yield and tensile strengths are lower than those previously reported. Graphs, micrographs, photographs, tables, diagram. 1 ref. (Q27, Zr)

92-Q. (Czech.) Choice of Materials for Parts Subject to Abrasive Wear. J. Shon. *Strojirenstvi*, v. 5, no. 7, July 1955, p. 525-529.

Influence of impact stress on choice of alloys to increase abrasion resistance. Properties of manganese steel. Hard-facing as an economical substitute for alloying. Tables. (Q9, L24, CI, AY, SG-m)

93-Q. (French.) Lowering the Apparent Limit of Elasticity of Steels by Creep After Beginning of Cold Working at Ordinary Temperature. Ferdinand Campus and Kasimierz Gamski. *Comptes rendus*, v. 241, no. 22, Nov. 28, 1955, p. 1552-1554.

Study of carbon-manganese-silicon and carbon-manganese steels subjected to drawing. 1 ref. (Q21, Q3, AY-p)

94-Q. (French.) Study of the Mechanical Relaxation of Residual Welding Stresses During Static Stress and Fatigue. F. Hebrant, H. Louis, W. Soete and A. Vinckier. *Revue de la soudure (Brussels)*, v. 11, no. 3, 1955, p. 139-151.

Research on the influence of residual stresses on the possible behavior of a welded object. Diagrams, tables, graphs, photographs. (Q25, K9)

95-Q. (French.) Methods of Fracture as a Function of the Stress State and Temperature. F. Hebrant, H. Louis, W. Soete and A. Vinckier. *Revue de la soudure (Brussels)*, v. 11, no. 3, 1955, p. 152-173.

Research on the fracture of typical welded assemblies from design considerations. Factors influencing brittle fracture. Graphs, photographs, tables, diagrams. (Q26, K general)

96-Q. (French.) Torsion Test, Method of Inspecting Flat Pieces of Effervescent Steel. J. Nils. *Revue universelle des mines*, v. 98, ser. 9, no. 11, Oct. 1955, p. 499-500.

Test for economic evaluation of the compactness of effervescent steel ingots. Diagram. (Q1, ST)

97-Q. (Russian.) Amount of Worn Material as Index to Extent of Wear. V. B. Liadskii. *Liteinoe proizvodstvo*, 1955, no. 10, Oct., p. 10-13.

Analyzes process of wear through friction by study of the wear-products. Suggests application of the method for different types of ferrous materials. Tables, diagrams. (Q9, CI)

98-Q. (Russian.) The Theory of Anti-Friction Properties of Ductile Cast Iron. Ia. G. Lifshits. *Liteinoe proizvodstvo*, 1955, no. 10, Oct., p. 22-23.

Comparative evaluation of anti-friction pearlite-ferrite and normalized forgeable cast iron, and the anti-friction gray cast iron Ts-1 and Ts-2, as bearing materials. 8 ref. (Q9, CI)

99-Q. (Russian.) Endurance Strength of Copper and Some Copper Alloys. A. P. Simakovskii. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 32-38.

Chemical composition and mechanical properties with different temperatures and treatment. Tables, graphs. (Q general, Cu)

100-Q. (Russian.) Hardness of Surface Diffusion Layers at High Temperatures. G. F. Beliaeva and M. G. Lozinskii. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 54-57.

Determination of surface hardness at temperatures up to 1100° C. in vacuum. This method permits the determination of the character of diffusion layers in the range of operating temperatures. Graphs, micrographs. 8 ref. (Q29, N1)

101-Q. (Russian.) Mechanical Properties of Large Forged Pieces. A. N. Zhironkin, A. D. Men'shikov, and P. D. Khinskii. *Stal'*, v. 15, no. 11, Nov. 1955, p. 1016-1022.

Heat treated cross sections of large pieces (700 mm. in diam.) showed marked increase of nonuniformity in properties of metal which is explained by increased hydrogen

concentration in the deeper layers of the piece. Tables, graphs, diagrams. (Q general, F22)

102-Q. (Spanish.) **Determination of the Elastic Constants of Metallic Materials by Sound Propagation Measurements.** H. J. Seemann. *Instituto del hierro y del acero*, v. 8, no. 38, July-Sept. 1955, p. 398-405.

Methods and calculations. Graphs, oscillograms, diagrams. 14 ref. (Q21)

103-Q. How Oil Viscosity Affects Piston Ring Wear. M. Popovich and L. E. Johnson. *Automotive Industries*, v. 114, Jan. 1, 1956, p. 56-57, 106.

Tests correlate engine wear with oil viscosity. Viscosity range of SAE 10 to 20 appears ideal. Graphs, diagram. (Q9)

104-Q. Plain-Bearing Fatigue Testing. E. D. Brailey and W. J. Donnelly. *Communications and Electronics*, v. 3, Jan. 1956, p. 16-18.

Testing of engine-bearing systems using electronic and hydraulic techniques. Diagrams, photographs, graph. (Q7)

105-Q. An Apparatus for Obtaining the Tensile Properties of Irradiated Materials at Elevated Temperatures. R. E. Hueschen and D. C. Kaulitz. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-38991, Sept. 1955, 22 p.

Tensile-testing unit which permits testing of highly radio-active specimens at temperatures up to 800° C. The vacuum tensile furnace, mounted on a 60,000-lb. Baldwin tensile machine, is constructed to permit measurement of elongation by a newly developed optical instrument. Graphs, table, diagrams, photographs. (Q27, ST, SS)

106-Q. Final Report on Development and Testing of Nickel-Molybdenum Alloys. F. C. Monkman, Jr., N. J. Grant and C. F. Floe. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1990, Nov. 1955, 43 p.

Determines effect of vacuum melting and variations in composition on the ductility, mechanical and stress-rupture properties of nickel-molybdenum alloys. Tables, diagram, graphs, micrographs. (Q23, Q4, C25, Ni, Mo)

107-Q. Stresses From Radial Loads and External Moments in Cylindrical Pressure Vessels. P. P. Bijlaard. *Welding Journal*, v. 34, Dec. 1955, p. 608S-617S.

Design information on deflections, bending moments and membrane forces and on influence of internal pressure. Diagrams, graphs, tables. 4 ref. (Q25)

108-Q. Longitudinal Deformation of Long Beam Due to Fillet Welding. Tokutano Sasayama, Koichi Masubuchi and Sigeru Moriguchi. *Welding Journal*, v. 34, Dec. 1955, p. 581S-582S.

Effects of joint dimension, weight of deposited metal, other welding procedures on deformation. Diagrams, table, graphs. (Q24, K1, ST)

109-Q. Studies on the Brittle Failure of Tankage Steel Plates. F. J. Feely, Jr., M. S. Northup, S. R. Kleppe and M. Gensamer. *Welding Journal*, v. 34, Dec. 1955, p. 596S-607S.

Studies progress of fractures under conditions similar to those in real structures, correlates results with values obtained from conventional tests. Diagrams, graphs, tables. 14 ref. (Q26, ST)

110-Q. (English.) **On the Effect of Ordering Upon the Strength of Cu_3Au.** G. W. Ardley. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 525-532.

Room-temperature strength decreases as the degree of long-range order within the antiphase domains increases, and as these domains grow larger the room-temperature strength first increases and then decreases. Graphs, table. 28 ref. (Q23, N10, Cu, Au)

111-Q. (English.) **Some Anelastic Phenomena in Alloys of Gold and Nickel.** Choh-Yi Ang, J. Sivertsen and C. Wert. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 558-565.

Two relaxation peaks are found in polycrystalline alloys between room temperature and 600° C. One of these peaks has been identified as the order peak, the origin of the other is uncertain. Diagram, graphs, micrographs, tables. 14 ref. (Q22, Au, Ni)

112-Q. (English.) **Mechanism of Internal Friction Due to the Motion of the Dislocation.** Tokutaro Hirone, Nobuhiko Kunitomi and Masajiro Abe. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 960-966.

Studied from the measurement on the variation of internal friction with cold work. For copper, internal friction increases with the initial cold work and decreases after showing a maximum. Diagram, graphs, table. 12 ref. (Q22, Cu)

113-Q. (Italian.) **Fatigue Resistance Test FR of Light Alloys. Influence of Experimental Factors.** G. Panseri and F. Gatto. Alluminio, v. 24, no. 5, Sept.-Oct. 1955, p. 447-458.

Results of a series of tests for the determination of the influence of shape, size and superficial finishing of specimens on the results of fatigue resistance tests. Tables, diagrams, micrographs, graphs. 11 ref. (Q7, Al)

114-Q. (Italian.) **Researches Concerning the Anisotropy of the Resistance to Fatigue of Ergal 65 TA Alloy.** C. Panseri and F. Gatto. *Alluminio*, v. 24, no. 5, Sept.-Oct. 1955, p. 459-463.

Dispersion of test results prevented comparisons between specimens. Causes of the variations could not be identified. Tables, diagrams, graphs. 8 ref. (Q7, Al)

115-Q. (Japanese.) **Influence of Copper on Spring Steel (Sup 6). II.** Toshio Kodaira and Yoichi Yasuda. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1098-1102.

Influences of copper content on the properties, at ordinary temperatures, of silicon-manganese spring steel. Graphs, table. 5 ref. (Q general, AY, SG-b)

116-Q. (Japanese.) **Studies on Ball Bearing Steels. II. Effect of Some Metallurgical Factors on Life of Ball Bearing Steels.** Manabu Ueno, Tetsutaro Mitsuhashi and Yutaka Nakano. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1102-1107.

To determine relation between some metallurgical factors and life, chemical composition, nonmetallic inclusions, hardness, compressive load of inner rings, cementite content, grain size and forging degree were tested. Graphs. 5 ref. (Q9, AY, SG-c)

117-Q. (Japanese.) **Studies on Mechanical Properties of 19-9 DL.** Taro Hasegawa, Osamu Ochiai and Junich Ino. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1112-1118.

Effect of columbium is distinct at longer time or higher temperature of testing and at "hot cold working" rather than in age hardened state. Tables, graphs, micrographs. 2 ref. (Q general, SS)

R

Corrosion

46-R. Cathodic Protection Circuits. E. W. Schwarz and R. M. Wainwright. *Applications and Industry*, 1955, no. 21, p. 311-315.

Outlines corrosion problem and advantages and disadvantages of present methods of attack. Purpose and implications of equivalent electric network and how it may be solved for corroding cell; use of present methods of circuit analysis to establish criterion for cathodic protection. Diagrams. 4 ref. (R10)

47-R. Corrosion in Borated and Deionized Water at Temperatures up to 500° F. Walter K. Boyd and Robert S. Peoples. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1047, Oct. 1955, 20 p.

Stainless steels, beryllium and aluminum alloys studied. Photographs, micrographs, tables. (R11, R4, SS, Be, Al)

48-R. Corrosion: How It Affects Materials Selection and Design. Russel W. Henke. *Materials & Methods*, v. 42, Nov. 1955, p. 119-134.

Comprehensive manual covering types and mechanisms of corrosion and designs to reduce corrosion. Photograph, diagrams, charts. 7 ref. (R general)

49-R. Corrosion and the Modern Power Station. Edmond C. Potter. *Research*, v. 8, Dec. 1955, p. 450-455.

Problem and cost of corrosion in steam boilers, with particular reference to the power station industry; research program proposed. Photograph, micrographs, diagram. 5 ref. (R4)

50-R. Stress Corrosion and Relaxation of High Carbon Steel Wire for Prestressed Concrete. Fritz Schwier. *Wire and Wire Products*, v. 30, Dec. 1955, p. 1473-1479, 1519-1521.

Tests and results for both drawn and oil-tempered steels. Photographs, graphs. 3 ref. (R1, CN)

51-R. (Czech.) **Corrosion of Aluminum and Its Alloys.** B. Puchnar. *Strojirenstvi*, v. 5, no. 8, Aug. 1955, p. 605-608.

Intercrystalline, spot and uniform corrosion; effect of various metals and electric current; corrosion caused by inorganic salts, building materials and impregnation preparations; criteria for choice of materials in contact with aluminum parts. Table, diagrams. (R general, Al)

52-R. (French.) **Light Alloys and Prevention of Corrosion.** Jean Hérenguel. *Métaux, corrosion-industries*, v. 30, no. 361, Sept. 1955, p. 315-323.

Corrosion tests on industrial light alloys; influence of heat treatment on corrosion properties; methods of corrosion protection. Graphs, photographs. (R11, J general, EG-a)

53-R. (French.) **Electrochemical and Chemical Factors in Wet Corrosion.** B. Le Boucher. *Métaux, corrosion-industries*, v. 30, no. 361, Sept. 1955, p. 324-339.

Electrochemical nature of corrosion, accelerated tests of corrosion, conditions of test data evaluation. Graphs, diagrams. 10 ref. (R1, R11)

54-R. (French.) **Corrosion Protection of Magnesium Alloys.** Maurice Hardouin. *Métaux, corrosion-industries*, v. 30, no. 361, Sept. 1955, p. 340-346.

Influence of alloying elements on

corrosion properties and an evaluation of corrosion protection methods. Graphs. 5 ref. (R10, Mg)

55-R. (German.) Aeration Cells. Heribert Grubitsch. *Monatshefte für Chemie,* v. 86, no. 5, Oct. 1955, p. 752-764.

Iron corrosion in a neutral aerated electrolyte solution as a pure diffusion controlled process. Table, graphs, diagram. 37 ref. (R6, R1, Fe)

56-R. Corrosion of Stainless Steels in Supercritical Water. H. A. Pray and W. K. Boyd. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-901, Feb. 1954, 19 p.

Materials evaluated on basis of weight gain and metallographic examination. Graph, tables, micrographs. (R4, SS)

57-R. Reaction of Nickel in Molten Sodium Hydroxide. Robert S. Peoples, Paul D. Miller and H. Dale Hannan. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1041, Sept. 1955, 12 p.

Sodium oxide is shown to be a product of the nickel-sodium hydroxide reaction at 950° C. under either an argon or hydrogen atmosphere. Discussion of its role in the corrosion mechanism. Graph, tables. (R11, R6, Ni)

58-R. Corrosion of Selected Materials in Pentalene 290 and a Mixture of Dowtherm A and Alkylbenzene. Walter K. Boyd and Robert S. Peoples. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1046, Oct. 1955, 9 p.

Aluminum 52S and 61S, coupled and uncoupled samples of Armco 17-7PH, type-316 stainless steel, Hastelloy X, Croloy 5, Alfenol(15.5Al), zirconium-5 wt.% tin, Zircoloy 2, and beryllium were tested. Pentalene 290 decomposes rapidly at temperatures of 600° F. and above. Diagram, tables, photographs. (R7)

59-R. Corrosion in Singapore. Problems of Packaging and Storage in the Tropics. P. A. Cartwright. *Corrosion Technology,* v. 2, Nov. 1955, p. 362-365.

Climate, mold growths and insects present adverse conditions for the preservation of materials. Tables. 18 ref. (R3, P10)

60-R. Modern Stainless Steels. *Edgar Allen News,* v. 34, Dec. 1955, p. 278-279.

Corrosion resistance of British "Imperial" and "Maxilvry" stainless steels to various media. Table, photograph. (To be continued.) (R general, SS)

61-R. Some Aspects of Canning Soft Drinks. H. T. Johnson, A. W. McAlpin and A. M. Schenck. *Food Technology,* v. 9, Dec. 1955, p. 643-647.

Factors adversely affecting shelf life. Development of a "corrosivity tester". Graphs, table. (R11, R7)

62-R. Prevention of Scale and Corrosion in the Water Cooling Systems of Internal Combustion Engines. E. L. Streatfield. *Gas and Oil Power, (Annual Technical Review Number),* v. 50, 1955, p. 315, 316, 319.

Conclusions on the process and distribution of corrosion. Particular attention given to under-water corrosion, with sodium benzoate as an inhibitor. 12 ref. (R4)

63-R. Adapting the Static Water Drop Test to Research Methods. E. J. Schwoegler and L. U. Berman. *Lubrication Engineering,* v. 11, Nov.-Dec. 1955, p. 381-388.

Presents in detail method of preparing specimens so that a shorter test period of 48 hr. can be used with duplicate samples. Test results are quite precise and accurate. More rapid tests are thus possible so that a large number of polar organic compounds may be evaluated in the search for optimum corrosion inhibition. Tables, photographs. 2 ref. (R11, R10, ST)

64-R. The Life of Ball and Roller Bearings. R. H. Warring. *Machinery Lloyd (Overseas Ed.),* v. 27, Dec. 3, 1955, p. 69, 71, 72.

Various factors of failure with particular attention to fretting corrosion. An empirical formula to determine expectant life is presented. Table. (R1)

65-R. Corrosion and Materials in the Water Works Field. R. W. Henke. *Water & Sewage Works,* v. 102, Dec. 1955, p. 508-510.

Several factors involved in metallic corrosion given as a guide to combatting the condition. Diagrams, table. (R1, R4)

66-R. (English.) Selective Oxidation of Silver-Magnesium Alloys in Water Vapor. Masaki Hirashima. *Physical Society of Japan, Journal,* v. 10, no. 12, Dec. 1955, p. 1055-1064.

Simple method for measuring low rates of oxidation at elevated temperatures with water vapor used as oxidizing agent. It is found that the MgO layer builds up on the surface of the alloy according to a parabolic law, and the oxide growth begins to follow a linear law rather than a parabolic law at a pressure of 1 mm.Hg. Diagrams, micrographs, graphs, table. 22 ref. (R2, Ag, Mg)

67-R. (German.) Influence of Optical Whitening Agents on the Corrosion of Copper. O. Uhl. *Fette, Seifen, Anstrichmittel,* v. 57, no. 10, Oct. 1955, p. 793-797.

Shows no increased corrosion in the presence of optical whitening agents even with subsequent chlorine-bleaching, and treatment with thiosulfate. Tables, graphs, photographs. (R5, R7, Cu)

68-R. Attack on Materials by Lead at 1000° C. W. D. Wilkinson, E. W. Hoyt and H. V. Rhude. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5449, Oct. 1955, 30 p.

Static tests carried out on a method for determining the resistance of materials to attack by lead at 1000° C. Tables, micrographs, diagrams. 5 ref.

(R6, Ta, Cb, ST, Ni, U, Mo, Zr, Ti)

69-R. Induced Alternating Current Used for Cathodic Protection of a Coated Pipe Line. S. J. Bellassai. *Corrosion,* v. 12, Jan. 1956, p. 17-19.

A 5-amp., 15-volt selenium stack, 10 3-in. × 60-in. graphite rods, and 500 ft. of 1/0 copper cable provided circuit resistance of the required value to cathodically protect a coated pipe line. 1 ref. (R10)

70-R. Nomograph for Corrosion Rate Calculations. Henry K. Bass, Jr., and Robert V. Andrews. *Corrosion,* v. 12, Jan. 1956, p. 20-21.

Means for determining corrosion rate in mils per year. Nomograph. 5 ref. (R11)

71-R. High Temperature Hydrogen Sulfide Corrosion. E. B. Backensto, R. D. Drew and C. C. Stapleford. *Corrosion,* v. 12, Jan. 1956, p. 22-30; disc., p. 30-32.

Proposed methods for minimizing corrosion include reduction of hydrogen sulfide in process streams, use of chromium-nickel alloys, protection of metals by aluminum coating. Micrographs, tables photographs, graphs. 3 ref. (R5, L15)

72-R. Correlation of the Results Obtained With Corrosion Inhibitors in the Laboratory and in the Field. G. E. Purdy and William J. Ries. *Corrosion,* v. 12, Jan. 1956, p. 33-37; disc., p. 37-38.

Factors influencing internal corrosion in oil wells. Field and laboratory tests with three crude oil and brine systems using two organic inhibitors were correlated. Diagram, graphs, tables. 10 ref. (R10, R11)

73-R. Inhibition of Metallic Corrosion in Aqueous Media. Harry C. Gatos. *Corrosion,* v. 12, Jan. 1956, p. 39-48.

Corrosion processes from an electrochemical standpoint and organic and inorganic inhibitors. Tables, diagrams, graphs. 100 ref. (R10)

74-R. Investigation of an Unusual Cause of Shipbottom Pitting. R. P. Devoluy. *Corrosion,* v. 12, Jan. 1956, p. 49-54.

For severe corrosion to occur, the antifouling paint must be in contact with the steel hull, and the painted surface must be exposed to sulfide forming or sulfide bearing waters. Photographs, tables. (R4, R2, L26)

75-R. Corrosion of Gasoline Engine Exhaust Valve Steels. C. H. Allen and M. J. Tauschek. *Corrosion,* v. 12, Jan. 1956, p. 55-59; disc., p. 59-62.

Method for evaluating corrosion resistance, effect of analysis variation in various alloy steels as it influences corrosion, influence of silicon on corrosion, effect of a variation in nickel-iron content on aircraft valves, use of valve rotators in reducing valve corrosion. Graphs, photographs, tables. (R9, ST)

76-R. Final Report on Four Annual Anode Inspections. *Corrosion,* v. 12, Jan. 1956, p. 63-74.

Data obtained from four test ground beds concerning the performance of steel, and carbon and graphite anodes in natural soils, and in carbonaceous backfill. Graphite anodes in a carbonaceous backfill gave best results. Tables, graphs. (R10)

77-R. Progress Report of Task Group T-4F-1 on Water Meter Corrosion. *Corrosion,* v. 12, Jan. 1956, p. 77-80.

Identifies manner in which corrosion effects individual parts and factors contributing to corrosion. Micrographs, diagram. (R4)

78-R. Corrosion Studies Aid Light Metals. Frederick W. Fink. *Corrosion Technology,* v. 2, Dec. 1955, p. 372-374.

Factors which have made aluminum, magnesium and titanium of greater industrial importance. Graphs. (R general, Al, Mg, Ti)

79-R. Salt Spray Testing. G. B. Hogaboom, Jr. *Metal Finishing (Guidebook—Directory Ed.),* 1956, p. 496-499.

Typically used specifications for salt spray testing. (R11)

80-R. Corrosion of Metals. S. C. Britton. Paper from "Reports on the Progress of Applied Chemistry". v. XXXIX. Society of Chemical Industry, p. 105-116.

High temperature, atmospheric, in water and underground, agents and resistant materials, inhibitors, protective coatings, cathodic protection. 118 ref. (R general)

81-R. (German.) Chemical Behavior of Aluminum Materials. *Aluminium Ranshofen, Mitteilungen,* v. 3, no. 2, Oct. 1955, p. 31-34.

Effect of surface conditions on corrosion protection, types of corrosion, solubility potential, corrosion under influence of different gaseous media. Tables. (To be continued.) (R9, R2, R10, Al)

82-R. (Russian.) **Mechanism of Oxygen Transfer Through Thin Electrolyte Layers.** *Doklady akademii nauk SSSR*, v. 104, no. 6, Oct. 21, 1955, p. 876-879.

Proves, by experiments, that usually irregular evaporation of electrolyte from the metal surface facilitates stirring of thin electrolyte layers. This fact results in decreasing diffusion layer thickness and in increasing oxygen supply to the metal surface. Tables, graphs. 14 ref. (R2)

83-R. (Book.) **Corrosion in Action.** 47 p. 1955. International Nickel Company, Inc., 67 Wall St., New York 5, N. Y.

Nature of corrosion, anode and cathode processes, origin and characteristics of corrosion currents, and passivity and protective films. (R general)

S

Inspection and Control

31-S. Analysis of Oxygen and Nitrogen in Uranium. Cecil B. Griffith, William M. Albrecht, and Manley W. Mallett. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1033, Aug. 1955, 8 p.

Evaluates reliability of the vacuum-fusion and Kjeldahl methods used in uranium analysis. Tables. 5 ref. (S11, U)

32-S. Methods for Measuring the Hydrogen Content of Weld Metal. P. D. Blake. *British Welding Journal*, v. 2, Dec. 1955, p. 558-561.

Laboratory methods for measuring diffusible and residual hydrogen contents of ferrous weld metal. These two values can be determined separately by collecting the diffusible hydrogen under mercury at room temperature and subsequently extracting the residual hydrogen by vacuum heating; alternatively, the total hydrogen may be determined in a single step by vacuum heating. Diagrams. (S11, K9, ST)

33-S. Pneumatic Comparator for Measuring Variation in Diameter of Bores. I. G. Morgan and D. C. Barnes. *Engineer*, v. 200, Dec. 2, 1955, p. 795-796.

In conjunction with a suitable reference standard of size it may be used for the absolute determination of diameter. An accuracy of ± 0.00001 in. (±0.25μ) is achieved. Graphs, photographs, diagrams. 4 ref. (S14)

34-S. The Application of Spectrographic Solution and Powder Methods to the Analysis of Miscellaneous Samples. P. T. Beale and Daphne A. Poynter. *Metallurgia*, v. 52, no. 313, Nov. 1955, p. 253-261.

Practical experiences with the various techniques and specific applications of several methods. Diagrams, tables. 16 ref. (S11)

35-S. Gas Analyzers for Efficient Furnace Operation. E. C. Lang. *Metal Treating*, v. 6, Nov.-Dec. 1955, p. 10 + 5 pages.

Flexible, portable-type instrument provides information regarding conditions in all phases of combustion processes in all parts of the furnace. Diagrams, photographs, graphs, table. (S11)

36-S. Ultrasonic Inspection Speeds Drive-Tubing Output. Leo Adams. *Metalworking Production*, v. 99, Nov. 11, 1955, p. 1905-1907.

Equipment, methods and advantages of continuous inspection of 3-in. steel tubing weld quality. Photographs, diagram. (S13, CN)

37-S. (French.) **Some Aspects of Utilizing Radioactive Elements. II.** Roland Muxart. *Revue générale des sciences pures et appliquées*, v. 62, nos. 7-8, July-Aug. 1955, p. 202-221.

Application of radioactive isotopes in industrial research, particularly ferrous metallurgy, glass and ceramic works, mechanical engineering. Table. 175 ref. (S19)

38-S. (German.) **Recent Experiences in the Measurement of the Dust Content of Industrial Gases.** Kurt Guthmann. *Stahl und Eisen*, v. 75, no. 23, Nov. 17, 1955, p. 1571-1582.

Techniques for quantitative measurement of dust content. Diagrams, graphs, tables, photographs. 16 ref. (S11)

39-S. An Improved Barium Sulphate Method for the Determination of Sulphur in Steel. B. Bagshawe and A. L. Pill. *Analyst*, v. 80, Nov. 1955, p. 796-802.

Modified and simplified procedure in which hydroxylamine hydrochloride is used to decompose residual nitrate. This modified procedure is applicable, without loss of accuracy, in all ranges of chromium content and to all classes of highly alloyed steel, with the exception of steels of high titanium content. The precision of determination is within 0.002% of sulphur in all normal sulfur ranges. Tables. 4 ref. (S11, ST)

40-S. Temperature-Indicating Material Used for Weld Inspection. D. Lichtman. *Iron Age*, v. 176, Dec. 8, 1955, p. 146-147.

New, fast method of weld inspection using an optical scanning device and a temperature-indicating material is well-suited to automatic production by inert gas-shielded arc welding. Up to 12,000 welds can be examined in an hour. Photographs, diagram. (S16, ST)

41-S. Spectrographic Determination of Residual Elements in Steel. *Iron and Steel Institute, Journal*, v. 181, Dec. 1955, p. 316-318.

Method for determination of vanadium, molybdenum, cobalt, tin and titanium, using a low-voltage intermittent-arc source unit. Diagrams, tables. 7 ref. (S11, ST)

42-S. Application of Radioactive Tracers in the Petroleum Industry. *Lubrication*, v. 43, Dec. 1955, p. 133-144.

Presents background information for understanding properties of radio-active isotopes which make them useful as tracers. Successful applications in the petroleum industry with the main emphasis on lubrication problems. Tables, diagrams, photographs, graphs. 40 ref. (S19, Q9)

43-S. Commercial Tolerances for Compression Springs. I. *Mainspring*, v. 16, Dec. 1955, p. 3-6.

Tolerances for coil and spring diameters, free length and commercial load. Tables, diagram. (S22)

44-S. Materials Engineering File Facts. Standard Brazing Filler Metals. *Materials & Methods*, v. 42, Dec. 1955, p. 137, 139.

Classification, composition, properties, forms and uses of aluminum, copper, silver, magnesium and gold brazing alloys. (S22, K8, Zn, Al, Cu, Au, Mg, Ag, Ni)

45-S. A Simple Coulometer Method for Tin Coating Determination. J. Monvoisin and M. Le Blanc. *Tin and Its Uses*, 1955, no. 33, p. 3-5.

Apparatus which permits rapid measurement of free tin and alloyed tin with a good degree of accuracy. Diagram, photograph. 5 ref. (S14, L16, Sn)

46-S. Gamma-Radiographic Control of Welded Transmission Pipelines. II. C. C. Bates. *Welding and Metal Fabrication*, v. 23, Dec. 1955, p. 465-471.

Discussion of staffing, records and economics of project. Diagrams, graphs, tables, photographs. 10 ref. (S13, S19, ST)

47-S. (Czech.) **Measuring Sheet Thickness During Cold Rolling.** F. Wiesner. *Strojirenstvi*, v. 5, no. 10, Oct. 1955, p. 779-785.

Mechanical, electrical and optical equipment for direct contact measurement; pneumatic, magnetic, ultrasonic and X-ray apparatus as indirect contact devices. Methods of combining continuous measurement with automatic control to insure even thickness. Diagrams. 8 ref. (S14, F23, ST)

48-S. (French.) **Ultrasonic Detection of Internal Defects of Rails. The Sonirail.** J. Palme. *Revue de métallurgie*, v. 52, no. 9, Sept. 1955, p. 711-717.

Detection of internal cracks is accomplished by both the sound signal intensity and its frequency. Micrographs, photograph. (S13, ST)

49-S. (Russian.) **Introduction Into Industry of Tungsten-Molybdenum Thermocouples for Measurement of Liquid Steel Temperatures.** S. K. Danishevskii. *Stal'*, v. 15, no. 11, Nov. 1955, p. 984-989.

An inexpensive thermocouple to determine temperatures up to 2400° C. for short periods. Photographs, table, graphs, diagrams. 4 ref. (S16)

50-S. (Russian.) **Temperature Control of Steel During Pouring.** V. G. Gruzin. *Stal'*, v. 15, no. 11, Nov. 1955, p. 989-993.

Application of tungsten-molybdenum thermocouple for constant control of temperature in the ladle making possible casting at an optimum temperature. Tables, diagrams, photographs. 4 ref. (S16, D9, Fe, ST)

51-S. (Russian.) **Radioactive Isotopes in Technology.** P. E. D'iachenko. *Vestnik akademii nauk SSSR*, v. 25, no. 10, Oct. 1955, p. 39-47.

Application of isotopes in metallurgy, machine construction, wear of machine parts, corrosion, machining, nondestructive tests, bio-chemistry and soil science. (S19)

52-S. Xeroradiography. Peter J. Farmer. *Aircraft Production*, v. 18, Jan. 1956, p. 8-12.

A new technique being developed to overcome some of the limitations of radiographic examination. Diagrams, graphs, micrographs, photographs. (S13)

53-S. Ultrasonics—How It Works and What It Does. Alexander Murdoch, Jr. *American Machinist*, v. 100, Jan. 2, 1956, p. 97-104.

Principles of operation, equipment and power necessary, factors to be considered in developing apparatus suitable for large-scale commercial application. Photographs, micrographs, table, diagram, graphs. (S13)

54-S. Colorimetric Determination of Molybdenum in Tungsten-Bearing Steels. Lewis J. Wrangell, Edward C. Bernam, Donald F. Kuemmel and Origen Perkins. *Analytical Chemistry*, v. 27, Dec. 1955, p. 1966-1970.

Results for tungsten-bearing standards and mixtures of standards which contain maxima of approximately 9% molybdenum, 18% tungsten, 19% chromium and 5% cobalt. Included are results for a number of compositions which simulate various trade steels. Tables, graphs. 10 ref. (S11, Mo, TS)

55-S. Industrial Applications of Ultrasonics. E. G. Richardson. *British Journal of Applied Physics*, v. 6, Dec. 1955, p. 413-415.

Possibilities and limitations of ultrasonics for echo-detection, high-frequency agitation and metallurgical applications. Photographs, diagrams. 6 ref. (S13)

56-S. A Tramp-Metal Detector. M. H. Goosey. *E. I. Du Pont de Nemours & Co. (U. S. Atomic Energy Commission)*, DP-135, Oct. 1955, 12 p.

Iron particle volumes of 3×10^{-4} cubic in. are easily detected inside an alloy rod 1 in. in diam. Photographs, diagrams. (S10, S13, Fe)

57-S. Titrimetric Determination of Zirconium. M. O. Fulda and J. S. Fritz. *Iowa State College, Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-596, Mar. 1955, 24 p.

Brief literature survey of gravimetric, colorimetric, volumetric, spectrographic methods. Tables. 68 ref. (S11, Zr)

58-S. High-Speed Unit Performs Three-Way Inspection. *Iron Age*, v. 176, Dec. 15, 1955, p. 100-102.

Continuous electromagnetic analysis of nonmagnetic or paramagnetic materials now appears feasible at speeds in excess of 300 ft. per min. Nondestructive technique is more sensitive and reveals more information than previous methods. Photographs. (S13, ST)

59-S. Device Improves Thermocouple Pyrometer Operation. D. H. Jones. *Iron Age*, v. 176, Dec. 15, 1955, p. 108-109.

Annealing practices are improved by equipment for detecting and temporarily repairing thermocouple circuit faults. Photographs. (S16, J23)

60-S. Determination of Magnesium in Nodular Cast Iron by Spectrographic Analysis. B. C. Kar and M. K. Gupta. *Journal of Scientific & Industrial Research*, v. 14, sec. B, Nov. 1955, p. 570-572.

Determination of small amounts by a spectrochemical method using standard metal electrodes. Graph, tables. 2 ref. (S11, Mg, Cl)

61-S. Testing Porosity, Adhesion and Hardness. Walter H. Prine. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 482-485.

Production testing procedures presented will permit a reasonable degree of control of deposits. 7 ref. (S13, L17, Q29)

62-S. Thickness Testing of Electrodeposits. Everett A. Hodges. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 486, 488-495.

Outlines microscopic, weight-area, hydrochloric acid spot test, micrometer, magnetic, anodic solution, dropping, jet test methods. Graphs, 13 ref. (S14, L17)

63-S. Chemical Analysis of Plating Solutions. Nathaniel Hall. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, p. 509-525.

Simple, accurate, rapid analytical methods adaptable for most all plating room control. (S11, L17)

64-S. Field Evaluation of Industrial Xeroradiography. Grover M. Taylor and Gerold H. Tenney. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 12-17.

Data on radiographic resolution, sensitivity and speed in which various energies were used. Photographs, diagrams, micrographs, tables. 3 ref. (S13, Al, ST)

65-S. A High Power Industrial Fluoroscopic Tube. D. T. O'Connor and E. L. Criscuolo. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 18-19, 26.

Describes failures and successes of two unusual X-ray tube designs which permit target loading many times greater than that of conventional tubes. Photographs, diagram. (S13)

66-S. Selection of Sources for Radiographic Use. Marvin G. Schorr. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 20-22, 26.

Characteristics of the more common isotopes as they offset radiography; costs of sealed sources; selection of source for different applications. Tables, graphs. (S13)

67-S. The Relationship of Nondestructive Testing to Quality Control. William P. Farnsworth. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 28-30, 34.

Relationship of nondestructive testing to the management function and responsibilities of quality control; some aspects of sampling which can contribute to efficient utilization of test methods. (S12)

68-S. Practical Conductivity Measurement for the Electrical Industry. William A. Cannon, Jr. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 32-34.

Applications of the Magnatest FM-100 conductivity meter to maintain close control over casting and heat traveling techniques in nonferrous foundries, sorting mixed alloys and in the electrical hardware industry. Photographs, table. (S general, E general)

69-S. (Book.) **Magnets and Magnetic Measuring Techniques.** R. K. Wakerling and A. Guthrie, editors. 213 p. 1949. Office of Technical Services, Dept. of Commerce, Washington 25, D. C. $1.45.

Four papers on design requirements, instruments, performance of model magnets, and tests on full-scale magnets. (S general, T8)

70-S. (Book.) **Chemical and Spectrographic Analysis of Magnesium and Its Alloys.** A. Mayer and W. J. Price. Sections individually paged. 1954. Magnesium Elektron Ltd., Manchester, England.

A compilation of recommended analytical procedures including chemical and physico-chemical methods and the theory and practice of spectrographic analysis. (S11, Mg)

T
Applications of Metals in Equipment

28-T. Fiber-Metallurgy—Its Use for Slip Ring Brushes. H. B. Nudelman, A. G. Metcalfe, and C. H. Sump. *Aeronautical Engineering Review*, v. 14, Dec. 1955, p. 31-32, 44.

Development of a molybdenum brush that helps solve the problem of brush bounce and thus reduces electrical noise in high-altitude flight. Micrograph, photograph. (T1, Mo)

29-T. American Experience With Magnesium Alloys. H. Wilkin Perry. *Aircraft Engineering*, v. 27, Dec. 1955, p. 417-417.

Recent work on aircraft primary structures in magnesium. Photographs, tables. (T24, Mg)

30-T. Miniature Metallized Lacquer-Film Capacitors. H. G. Wehe. *Bell Laboratories Record*, v. 33, Dec. 1955, p. 441-444.

Bulky pre-World War II capacitors were miniaturized first by depositing metal on thin strips of lacquered paper. Now, by a process invented at Bell Telephone Laboratories, the paper can be removed to leave only a thin film of metallized lacquer. These capacitors are particularly applicable to low-voltage circuits using transistors, and greatly conserve space. Photographs, diagrams, graph. (T1, L25)

31-T. Magnesium in the Volkswagen. L. C. Boehner. *Metal Industry*, v. 87, Dec. 2, 1955, p. 469-470.

Methods used in production of transmissions, engines and axles; advantages derived from use of magnesium in these parts. Table. (T21, Mg)

32-T. Aluminum Alloys Move Into Structural Markets. J. M. Pickett. *Civil Engineering*, v. 25, Dec. 1955, p. 44-47.

Increasing tensile strength of aluminum, by perfecting its alloys, increases its structural applications. Photographs. (T26, Q23, Al)

33-T. Developments in Collapsible Metal Tube Packaging. Lester B. Platt. *Drug and Cosmetic Industry*, v. 77, Dec. 1955, p. 779 + 5 pages.

Methods of solving special problems of liners caused by the unusual chemical composition of the new "wonder" drugs. Photographs. (T10, Al)

34-T. Metallurgy of Nuclear Power Production. A. B. McIntosh. *Engineer*, v. 200, Nov. 25, 1955, p. 759-763.

Metallurgical problems introduced in the preparation and irradiation of uranium or plutonium fuels; principles of protection of the fuel in fuel elements and limitations imposed by interaction of fuel, container and coolant. Graphs, tables, diagrams. (T25, U, Th)

35-T. Gettering of Gas by Titanium. Virgil L. Stout and Martin D. Gibbons. *Journal of Applied Physics*, v. 26, Dec. 1955, p. 1488-1492.

Methods used in gas sorption studies; specific gases and their reaction with titanium. Diagrams, graphs, table. 11 ref. (T1, N15, Ti)

36-T. Structural Materials for Heat Transfer in Nuclear Reactors. I. Selecting Materials for Liquid Sodium Systems. II. Zirconium Alloy for Water Systems. R. F. Koenig, E. G. Brush, D. E. Thomas and F. Forscher. *Materials & Methods*, v. 42, Dec. 1955, p. 110-117.

Problems considered are corrosion resistance, mass transfer, mechanical effects and transfer of radioactivity, if sodium is used as a heat transfer agent. Summarizes information available on the physical and mechanical properties and corrosion properties of Zircaloy-2, and its use in nuclear reactors. Micrographs, graphs, tables, photograph. 5 ref. (T25, R6, Zr)

37-T. Expanded Aluminum. *Modern Metals*, v. 11, Dec. 1955, p. 40, 42.

Advantages of this form over solid sheets, methods for producing both standard and flattened types, fabrication methods, and applications. Photographs. (T26, Al)

38-T. Target: Tops in Containers. E. A. Ferrell. *Modern Metals*, v. 11, Dec. 1955, p. 79-80, 82.

Rapid increase in the number of uses for aluminum foil has resulted in Alcoa and Ekco to pool their know-how and resources and bid for foil's biggest market. Photographs. (T10, Al)

39-T. Long Life Components in High Speed Equipment. Carl Siebke. *Precision Metal Molding*, v. 13, Dec. 1955, p. 47-48, 80.

Both investment and die castings are used to give the best functioning parts for high-speed presses. Photographs.
(T5, E13, E15, Zn, Al)

40-T. Gas Turbines: Where Investment Castings Fit In. *Precision Metal Molding,* v. 13, Dec. 1955, p. 54-55, 64-65.

Current and future applications of investment castings. Diagram, photographs. (T25, E15)

41-T. (French.) **Punching and Stamping Tools Made of Zinc Alloy.** Robert H. Lebre. *Métaux corrosion industries,* v. 30, no. 361, Sept. 1955, p. 357-362.

Characteristics of alloys Kayem-1 and Kayem-2; method for tool production; field of application of tools. Tables. (T6, Zn)

42-T. (German.) **Light-Metal Nails.** E. Nachtigall and H. Landerl. *Aluminium Ranshofen, Mitteilungen,* v. 3, no. 2, Oct. 1955, p. 36-40.

Calculation of bending stress, relation between material characteristics and diameter, comparison with commercial steel nails, suggestion for suitable nail shape, application of aluminum materials. Tables, graphs, photographs. (T7, EG-a)

V

Materials

General Coverage of Specific Materials

24-V. New Stainless Steels Containing 17% Cr—4% Ni—6% Mn and 18% Cr—5% Ni—8% Mn. *American Iron and Steel Institute, Contributions to the Metallurgy of Steel,* no. 47, 1955, 9 p.

Properties, corrosion resistance, fabrication characteristics. Tables, graph. (SS)

25-V. Rem-Cru C-130AM. *Rem-Cru Titanium Data Sheet,* 1955, Nov., 12 p.

Design, applications, physical and mechanical properties of 4% aluminum, 4% manganese, 92% titanium alloy. Tables, graphs. 3 ref. (Ti)

26-V. How to Work Non-Ferrous Metals. *American Machinist (1956 Production Planbook Issue),* v. 99, Mid-Nov. 1955, p. 17-128.

Concise information regarding heat treating, machining, forming, forging, joining and finishing. Tables, diagrams, photograph, graphs. (F general, G general, J general, EG-a)

27-V. Two Special Alloy Steels. *Edgar Allen News,* v. 34, Dec. 1955, p. 270-271.

Two steels, one designed to resist shock and abrasion while being adaptable by heat treatment to a considerable number of parts, the second designed to overcome temper brittleness. Table, graphs. (AY)

28-V. The Properties of Hiduminium 100 (S.A.P.) in Sheet Form. W. M. Doyle. *Sheet Metal Industries,* v. 32, no. 344, Dec. 1955, p. 889-898; disc. p. 902-906, 922.

Manufacturing process and physical property data, such as tensile strength, creep strength, fatigue endurance, physical constants, corrosion resistance and formability. Graphs, tables, diagrams, micrograph, photographs, 8 ref.
(Q general, R general, G general, P general, Al)

29-V. Nimonic Alloys and Other Heat-Resistant Materials in Sheet Form. H. E. Lardge. *Sheet Metal Industries,* v. 32, no. 344, Dec. 1955, p. 899-902; disc. p. 902-906, 922.

Some new alloys and applications for alloys formerly used in other forms. Requirements of gas-turbine aircraft engines considered. Tables, photographs. (T24, Ni, SS)

30-V. Properties and Uses of Fortiweld Steel. H. F. Tremlett. *Sheet Metal Industries,* v. 32, no. 344, Dec. 1955, p. 885-888; disc. p. 902-906, 922.

Particular emphasis placed on properties of interest to sheet-metal users. Techniques for working into fabricated sheet-metal components. Tables. (T general, ST)

31-V. (French.) **A New Nickel-Beryllium Alloy With Secondary Emission.** J. Millet. *Vide,* v. 10, nos. 58-59, July-Sept. 1955, p. 96-102.

Method of production, heat treatment, chemical analysis, micrographic and X-ray crystallographic studies. Treatment of alloy for the purpose of forming targets for secondary emission. Tables, graphs, micrographs. 8 ref. (T1, Be, Mg, Ni)

32-V. (German.) **Research Outlines for the Chemistry of Germanium.** Ekkehard Gastinger. *Fortschritte der chemischen Forschung,* v. 3, no. 3, 1955, p. 603-656.

Chemical and physical properties of germanium, its occurrence and geochemistry, production, purification, organic and inorganic compounds, electrochemistry, analytical chemistry, germanium as a component in systems. Tables. 310 ref. (Ge)

33-V. (Polish.) **Rare-Earth Metals in Metallurgy and Casting.** Janusz Czerminski. *Wiadomosci hutnicze,* v. 11, no. 10, Oct. 1955, p. 306-311.

Content of rare-earth metals and some other metals in earth's crust and their use in steelmaking and in castings, and their effect on cast iron and steel structure. Micrographs, tables, photograph, graph. (E general, EG-g, ST, SS, CI)

34-V. (Russian.) **Improvement of Composition of Tool Steels.** Iu. A. Geller. *Metallovedenie i obrabotka metallov,* 1955, no. 3, Sept., p. 1-16.

Comprehensive review of toolsteels for different operations now used in USSR and their improvement through composition and heat treatment. Tables, graphs. 18 ref. (TS)

35-V. (Slovenian.) **The Alloy Al Zn 5.5 Mg2 Cu2 (Cr) and Its Peculiarities.** Viktor Fettich and Anton Urbanc. *Rudarsko-metalurski zbornik,* 1955, no. 3, p. 197-207.

Small amounts of chromium were added to an aluminum alloy, and properties and forming characteristics determined. Best results were obtained by solution-heating at 475° C. for 20 to 30 min., quenching in cold water and age-hardening for 16 to 18 hr. at 120° C. Graphs, tables. 3 ref. (Al)

36-V. Brass and Bronze Alloys. O. R. Scott. *Canadian Metals,* v. 18, Dec. 1955, p. 30-32, 34.

Common brasses and bronzes in use; precautionary measures for producing good commercial castings. Photographs. (E general, Cu)

37-V. Modern Stainless Steels. J. Lomas. *Machinery Lloyd (Overseas Ed.),* v. 27, Dec. 17, 1955, p. 95-98.

Current assessment of the steels with respect to new developments, modifications and discoveries, together with the physical and mechanical properties for different groups. Table.
(P general, Q general, SS)

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CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Mar. 21	Walton Hills	Plant Visit	Ford Stamping Plant
Albuquerque	Mar. 30	La Fonda Hotel	A. O. Schaefer	A.S.M. of Tomorrow
Baltimore	Mar. 19	Engineers Club	D. O. Gittings	Aluminum Coatings on Steel
Boston	Mar. 2	M.I.T. Faculty Club	T. W. Lippert	Titanium Industry Today
Calumet	Mar. 13	Phil Smidt	E. Logelin	A Forward Look
Carolinas	Mar. 15	Salisbury	N. Tisdale, Jr.	Molybdenum in Steel and Iron
Chicago	Mar. 12	Furniture Mart	Bruce Kiner	Metallurgical Control of Heat Treated Parts
Chicago Western	Mar. 27			Joint Meeting with American Society of Tool Engineers
Cincinnati	Mar. 8	Eng. Soc. Hqtrs.	J. B. Morley	Ductile Iron and Its Accelerating Uses in Industry
Cleveland	Mar. 5	Hotel Hollenden	T. K. Glennan	Zay Jeffries Night
Columbia Basin	Mar. 13			Civilization Through Tools
Columbus	Mar. 7		O. E. Cullen	Controlled Atmospheres in Heat Treatment
Dayton	Mar. 14	Engineers Club	George Stern	Cerro-Metallic Materials and Refractories
Detroit	Mar. 12		E. S. Rowland	Recent Trends in Carburizing
Eastern New York	Mar. 13	Panetta's		Future of the Metallurgical Profession
Fort Wayne	Mar. 12	Hobby House Ranch	Ross Perry	Cold Extrusion
Hartford	Mar. 13		Plant Visit	
Indianapolis	Mar. 19	Village Inn	W. Docker	Powder Metallurgy
Lehigh Valley	Mar. 2	Hotel Traylor	W. P. Churchill	Patent Law and Metallurgy
Los Alamos	Mar. 30	La Fonda Hotel Albuquerque, N. Mex.	A. O. Schaefer	A.S.M. of Tomorrow
Los Angeles	Mar. 22	Rodger Young Auditorium	A. O. Schaefer	Manufacture and Heat Treatment of Large Steel Forgings
Mahoning Valley	Mar. 13	Post Room, V.F.W.	J. G. Cutton	Improving Service Life of Steel Mill Equipment
Milwaukee	Mar. 20	City Club	J. D. Graham	Industrial Applications of Radio-Active Isotopes
Montreal	Mar. 5	Queen's Hotel	H. G. DeYoung	Specialty Steel Mill Developments
Muncie	Mar. 13	Anderson	R. J. Perrine	Furnace Design
New Haven	Mar. 15	Hotel Barnum	Hans Ernst	Machinability of Steel
New Jersey	Mar. 19	Essex House	J. S. Parks	Metallurgy of Welding
New Orleans	Mar. 7			Grooving and Piercing Metal With Metallic Arc
New York	Mar. 12	Hotel Victoria		Importance of Automation to Industry
Northeast Pennsylvania	Mar. 8	Irem Temple Country Club	H. W. Funk	Joint Meeting With A.W.S.
Northwestern Pennsylvania	Mar. 22	Meadville	Ben H. Alexander	Metallurgy of Transistors
Oak Ridge	Mar. 21	K. of C. Hall	George Sines	Failure of Materials Under Combined Repeated Stress With Superimposed Static Stress
Oregon	Mar. 7			National Officers Night
Ottawa Valley	Mar. 6	P. M. R. L.	V. E. Lysaght	Hardness and Microhardness Testing
Peoria	Mar. 12	New Legion Bldg.	F. T. McGuire	Metallurgy of Cast Iron
Philadelphia	Mar. 23	Engineers Club	K. R. Van Horn	Precipitation Hardening of Metals
Jr. Section	Mar. 12	Engineers Club	W. O. Sweeny	Precision Investment Castings
Phoenix	Mar. 20		Donald Clark	
Pittsburgh	Mar. 8	Gateway Plaza	T. P. Donahue	Satellites
Puget Sound	Mar. 7	University of Washington Student Union		Civilization Through Tools
Purdue	Mar. 20	Memorial Union	W. D. Manley	Corrosion Under Special Conditions
Quebec	Mar. 12	Laval University	F. W. Bougler	Metallurgical Aspects of Machinability
Rockford	Mar. 28	Faust Hotel	A. E. Nehrenberg	TTT Curves, a Guide to Heat Treatment
Rocky Mt.	Mar. 23	Oxford Hotel		Civilization Through Tools
Saginaw Valley	Mar. 15	Hi Life Inn	W. S. Pellini	Aspects of Welding in Metallurgy
Springfield	Mar. 19	Blake's Restaurant	Leon Rosseau	Developments in Salt Bath Treating
Syracuse	Mar. 6	Onondaga Hotel	Austin Hiller	Toughness in Welds
Texas	Mar. 6	Ben Milam		
Tulsa	Mar. 6	Alvin Plaza Hotel	G. A. Fisher	Ductile Cast Iron—Properties and Applications
Warren	Mar. 8	El Rio Restaurant		Annual Bosses Night
Washington	Mar. 12		W. J. Youden	Statistics in Research and Industry
West Michigan	Mar. 19	Lock's Restaurant	N. O. Kates	Minimizing Heat Treating Headaches
Western Ontario	Mar. 10	London		Hard Chromium Plating
Worcester	Mar. 14	Hickory House	John Black	Continuous Casting of Steel
York	Mar. 14	Lancaster	R. Franks	High-Temperature Alloys

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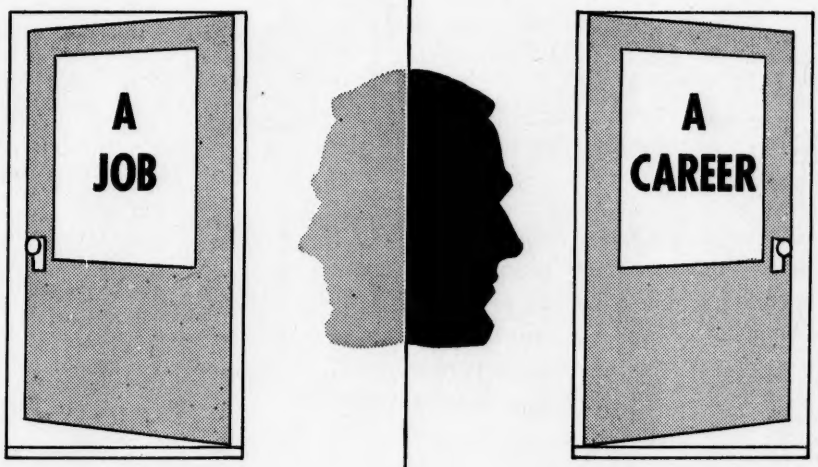

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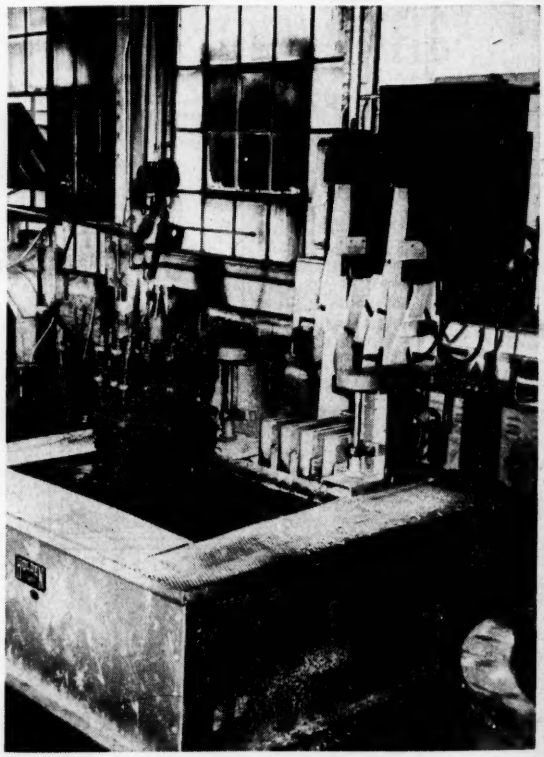

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Gears are quenched directly from adjacent pit carburizing furnaces.

Using a 100 kva HOLDEN Salt Bath Quench Furnace with a compensating constant temperature control blower system, increased life of gears has been obtained without necessitating design change. The gears quench out to a surface hardness of Rockwell C64-65, and have a case microstructure of 100% white needle martensite at the surface.

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This HOLDEN Type 401 Furnace is located between two pit-type carburizing furnaces. 500-750 lbs. are quenched directly from the pit carburizer into the molten salt with a velocity flow of 450 gallons per minute.

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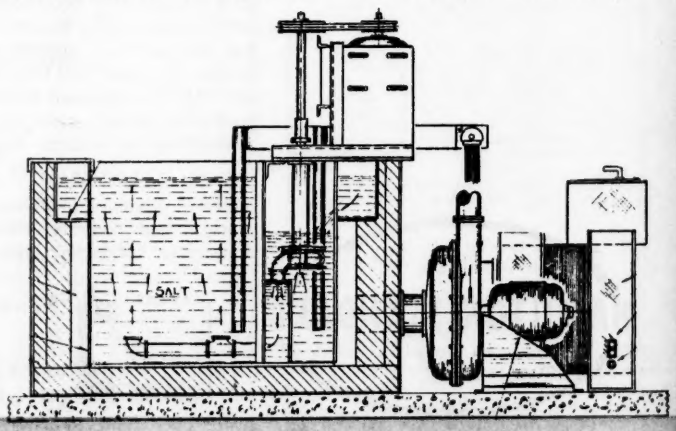

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